THE HOUSE-FLY AT THE BAR
INDICTMENT
GUILTY OR NOT GUILTY?

EVIDENCE:— IN THE MATTER OF THE PEOPLE

against

THE COMMON HOUSE FLY

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THE MERCHANTS' ASSOCIATION OF NEW YORK

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COMMITTEE ON

POLLUTION OF THE WATERS OF NEW YORK

EDWARD HATCH, Jr., *Chairman*

J. PIERPONT MORGAN — JOHN Y. CULYER, C. E.

ALBERT VANDER VEER, M. D. — DANIEL D. JACKSON, S. B.

THE HOUSE-FLY AT THE BAR

BY WAY OF EXPLANATION

IN DECEMBER, 1907, this Association published the report made to it by Daniel D. Jackson on the "Pollution of New York Harbor as a Menace to Health by the Dissemination of Intestinal Diseases Through the Agency of the Common House-Fly," in which he proved beyond a doubt that raw sewage discharged into large or small bodies of water, even if such water was not used for drinking purposes, furnished feeding grounds for flies, from which they gathered and spread the germs of typhoid fever and other intestinal diseases.

In cities whose sewers empty into lakes, tidal waters or slow-moving streams, deposits of filth are certain to collect on the banks or beaches, and house-flies are as certain to seek them out and to carry the disease germs from the sewage-polluted water-front inland to the homes of the inhabitants. Thus it will be seen that water-front conditions, similar to those which afflict New York, are to be found in many other cities, and that they, too, must grapple with the problem of protecting the health of their inhabitants from the closely associated pests of flies and untreated sewage.

So much interest was aroused by the publication of this report that the Association's Committee on Water Pollution has been encouraged to pursue its investigations of the habits of this pest, which Dr. L. O. Howard, Chief Entomologist of the Department of Agriculture, has re-christened the "typhoid fly" —and to assemble the testimony of the health officers and other expert sanitarians of the country as to the dangers arising from this cause and the means which may be taken to combat them.

With this end in view the Chairman of the Committee addressed the following letter to health officers, physicians and other authorities throughout the United States and Canada:

DEAR SIR:

Will you be so kind as to inform us whether your department has been making any investigations with regard to transmission of typhoid and other germ diseases through the medium of flies?

You are probably acquainted with the report made by Dr. Jackson, of this committee, on the dangerous activity of the common house-fly, and will understand our desire to have the benefit of your observations on the very important subject of disease transmission by flies.

Incidentally, we shall be glad to know what is your opinion as to the transmission of typhoid bacilli through impure milk and polluted water supply. We ask this question because some authorities have recently made the statement that

typhoid infection from these causes is insignificant as compared with that through the medium of flies.

We are gathering this information from all parts of the United States, and shall be pleased to send you a memorandum of the result when completed.

Yours truly,

EDWARD HATCH, JR., *Chairman.*

The result of the correspondence which ensued is embodied in the pages which follow. It is believed that the perusal of these letters and the extracts from the scientific monographs here presented will serve to convince those who may have hitherto given little thought to the subject that the common house-fly is one of the most dangerous pests in the world, and to stir all who read this little book to take an active part in the campaign for the extermination of flies by the removal of conditions which breed them.

EDWARD HATCH, JR., *Chairman.*
J. PIERPONT MORGAN.
JOHN Y. CULYER, C. E.
ALBERT VANDER VEER, M. D.
DANIEL D. JACKSON, S. B.
Committee on Pollution of State Waters, The Merchants' Association of New York.

WHAT HEALTH AUTHORITIES SAY ABOUT THE HOUSE-FLY.

Extracts from Letters Discussing its Agency in Spreading Typhoid Fever and Other Intestinal Diseases Received by the Committee on Water Pollution from All Parts of the Country.

While health authorities naturally hold varying views as to the relative influence of flies, polluted water and impure milk in the transmission of typhoid fever, there is practically no dispute of the assertion that flies do carry and disseminate the germs of the disease. The great importance attached to their agency as spreaders of typhoid and other germs by the majority of the correspondents who have answered the inquiries of the Committee is sufficient warrant for the publication of the letters which are here quoted.

FROM DR. G. W. COLER, HEALTH OFFICER, ROCHESTER, N. Y.

My Annual Report for 1906 contains the following reference to the house-fly:

"They not only become nuisances, but they are to a large extent carriers of disease. They fly from the polluted places in which they breed to the faces, mouths and noses of sleeping infants, and from thence to men, women and children. By these means they become the undoubted carriers of disease. Were it possible to cause all the manure piles to be properly cared for by covers and screens, it would not only rid the city of a pest, but prevent, to a considerable extent, the carrying of disease. In the near future one of the new departments of the newer medical science will busy itself with the removing of the manure heap, the house-fly, and other insect pests."

Rochester, N. Y., Nov. 7, 1908.

FROM J. N. HURTY, SECRETARY OF THE INDIANA STATE BOARD OF HEALTH.

We have records of several instances where typhoid fever was unquestionably transmitted by flies. The last instance was at the Wehrnely Orphans' Home, near Richmond, Ind. Sewage disposal at this Home is by the use of a dilapidated outhouse, or vault. The house is not fly-proof, and it was undoubtedly through flies that the typhoid epidemic was started. A man who had recently lost his wife came to the Home, bringing his child to be taken care of there. He was sick at the time and returned to die two weeks afterward, with typhoid fever. Within eighteen days after his visit typhoid fever broke out in the Home, one death and fourteen cases resulting. He used the outhouse, and there was no possibility of drainage getting into the well. Flies must have carried the infection. That typhoid fever may be transmitted through impure milk

and polluted water supply is beyond question. However, my observations lead me to believe that very rarely is the infection carried by impure milk, but quite frequently in polluted water. Much of our data leads me to believe that it is more frequently carried by flies than in other ways.

Indianapolis, Ind., Nov. 2, 1908.

THE SECRETARY OF THE KANSAS HEALTH BOARD, DR. S. J. CRUMBINE, SAYS:

A year ago this department undertook to make an investigation of the cause of typhoid fever that prevailed to an alarming extent in quite a number of the smaller towns in the western part of this State. The investigation was made by Prof. W. C. Hoad, civil and sanitary engineer for the State Board of Health, and the writer. Among the five towns thus visited it was determined that in no case was the typhoid epidemic due to the city water supply. In three of the cities visited we came to the conclusion that the disease was spread by flies. In each town the cases seemed to be in groups in certain portions of the city. That is to say, an initial case would start, and then, immediately surrounding this case, other cases would come down with the disease. There was no common milk or water supply in these three small towns, the first case being usually an imported one into the town from some other point, and then came the spread of the infection by the common house-fly. We invariably found a filthy condition of sterilization of the discharges and open privy vaults to which the fly had ready access, many of the houses using no screens whatever. Thus it was reasonable to conclude that the medium of dissemination was that of the fly. It was noted that the disease continued until the death of the fly by the advent of cold weather. This condition has prevailed in a number of the western towns in the State during the past year, and in the absence of the common milk and water supply, there seems to be no other conclusion than that the disease is spread through the infection of food by the fly and by personal contact between the sick and the well.

Topeka, Kan., Nov. 9, 1908.

THE "TYPHOID FLY" IN THE GREEN MOUNTAINS.

Several cases of typhoid infection through the agency of flies are reported by Dr. Henry D. Holton, of Brattleboro, Vt., Secretary of the Vermont State Board of Health: For several years one or more persons living on a large farm, which received its water supply from mountain springs, had typhoid fever in the autumn—new farm hands generally being the sufferers. No pollution of the water supply was discovered, but investigation showed that the farm privy was unscreened and swarming with flies, which had free access to the house and its food supplies. After the old closet was abandoned for more modern arrangements, and the house supplied with screens, no cases of typhoid occurred in the neighborhood. The daughter of another farmer in a section in which there had been no typhoid fever for many years came home when she developed a mild case of the disease. Two other children were stricken, and one died. Water conditions were found to be unobjectionable, but it was learned that the discharges from the patients had been thrown into a meadow opposite the house, which had no screens. Flies swarmed upon the table at meal time. "To my mind," says Dr. Holton, "undoubtedly the disease was communicated by the flies, all other sources of infection being excluded."

MOST OF ATLANTA'S TYPHOID FROM FLIES.

This department has made some investigations of the flies in this city; and in every instance we found the feet of the flies carrying colon organisms, and we have been endeavoring to have an ordinance passed by which to eliminate the common house-fly. We have been convinced for some time that the greater part of our typhoid fever comes more from the activity of the common house-fly than from any other source. Our records in the health office show that typhoid fever comes and goes with the house-fly, while other conditions appear to be the same.

CLAUDE M. SMITH, M. D.,
Atlanta, Ga., Nov. 5, 1908. Director of Laboratory of Hygiene.

TESTIMONY FROM LOUISIANA.

There can be no doubt that under certain conditions the house-fly is a greater element of danger than either the supply of impure milk or polluted water, or both. In large cities where the entire population is totally dependent for its milk supply upon the cunning and unscrupulous milkman, the danger from the adulteration of the product with impure water can scarcely be overestimated, and probably surpasses that due to the house-fly. I feel assured that when you have gathered your information from so many sources all over the country, as you propose doing, the result of your work will be most valuable as a matter of record.

J. A. ESTOPINAL,
Baton Rouge, La., Nov. 6, 1908. Secretary State Board of Health.

SECRETARY HUGH L. TAYLOR, OF THE COLORADO STATE BOARD OF HEALTH, SAYS:

In the city of Denver we had a very sad as well as plain demonstration of the transmission of typhoid fever by flies and milk. Early in August of this year the wife of a dairyman was taken with typhoid fever, remaining at home about three weeks before her removal to the hospital, August 28th. During the first two weeks in September we received reports of numerous cases of typhoid fever in the northern portion of Denver, and upon investigation found that all of these cases had been securing their milk from this dairy. An inspection of the dairy was then made, and in addition to learning of the illness of the dairyman's wife, we also found the dairyman himself suffering with a mild case of typhoid fever, but still up and delivering milk. The water supply of this dairy was fairly good. However, we found that the stools of both the wife and husband had been deposited in an open privy vault located thirty-five feet from the milk-house, which was unscreened and open to flies. The gelatine culture exposed for thirty minutes in the rear of the privy vault and in the milk-house among the milk-cans gave numerous colonies of typhoid bacilli, as well as colon bacilli and the ordinary germ life. The source of infection in the dairyman's wife's case is unknown, but I am positive that in all the cases that occurred on this milk route the infection was due to bacilli carried from this vault by flies and deposited upon the milk-cans, separator and utensils in the milk-house, thereby contaminating the milk. This dairyman supplied milk to 143 customers. Fifty-five cases of typhoid fever occurred, and six deaths resulted therefrom.

This epidemic was given wide publicity by our local papers and has been a vivid object-lesson to the people of Denver. Our Board for some time has

been endeavoring to educate the public and the merchants to the fact that a great many cases of tuberculosis, typhoid fever and kindred diseases are undoubtedly transmitted through the medium of flies. We have been pounding away all summer endeavoring to stop the exposure of foods and vegetables in unscreened condition in front of stores, and while we have not been completely successful, we have made a good start and through the public press we have carried on a campaign of education.

In closing I will say that I quite agree with the opinion of those authorities who maintain that the fly is one of the most common disseminators of typhoid infection. I think that one of the most important works for health authorities and sanitarians at present is to educate the public to the danger from flies.

Denver, Nov. 7, 1908.

FROM H. M. BRACKEN, EXECUTIVE OFFICER, MINNESOTA STATE BOARD OF HEALTH.

Several years ago, during the collection of troops for the Spanish-American War, an epidemic of typhoid fever broke out in one of the camps in this State, and in that instance the study was carefully carried on until the final conclusion was reached that the general infection was through flies. This report was sent in to the Surgeon-General of the Army at Washington. We fully recognize this possibility, as shown by our regulation relating to the construction of cesspools and vaults. Regulation 123 reads as follows: "All human excreta in cities and villages shall be deposited in sewers, cesspools or vaults. The cesspools or vaults must be made water-tight and fly-proof."

St. Paul, Minn., Nov. 11, 1908.

FLY-BORNE TYPHOID IN SOUTH DAKOTA.

I have just investigated a specific case in which a small epidemic of typhoid fever was undoubtedly caused from infection being carried by the common house-fly. The case was something like this: In a town of 1,500 population, with a sewer emptying into a neighboring stream, we had an unusual period of drouth, the stream becoming very low and the sewage emptying above the water level. This left a polluted cesspool accessible to flies and other vermin. About a dozen cases broke out in the immediate vicinity of this, the rest of the city being entirely free from it. The epidemic stopped as soon as the frost came and killed the flies. I believe that more cases of typhoid fever are caused by flies than by any other source of infection. They carry the germs and plant them in good culture media, such as milk, vegetables and other food products.

J. Grassick, M. D.,
Grand Forks, N. D., Nov. 16, 1908. Secretary State Board of Health.

A TYPHOID OUTBREAK DUE TO CONTAMINATED MILK.

Several years ago there occurred a small outbreak of typhoid fever of about a dozen cases. Each family affected derived its milk supply from the same dairy. There was no other common probable source of infection. Investigation of the dairy disclosed conditions which could very well have produced the infection, and the then acting health officer attributed the outbreak to contaminated milk. We exclude from the city the product of any dairy on

the premises of which there is typhoid fever and continue the exclusion of the product until all conditions which might favor the transmission of the disease are removed. We are also quite convinced that contaminated water is of the utmost etiologic importance in regard to this disease.

David J. Levy, M. D.,
Kalamazoo, Mich., Nov. 19, 1908. Health Officer.

AGAINST THE THEORY OF FLY EPIDEMICS.

We have studied the question of transmission of typhoid fever by flies to some extent, and are of the opinion that flies are common carriers of typhoid fever; especially is this true of isolated cases. However, we do not believe that flies cause epidemics of typhoid fever. Where we find a number of cases in a locality we are convinced that the water or milk is affected.

T. D. Tuttle, M. D.,
Helena, Mont., Nov. 6, 1908. Secretary State Department of Public Health.

FLIES SPREAD TYPHOID WITHIN AN INFECTED HOUSE.

Generally speaking, neighborhood typhoid (local epidemics) is due to milk and flies. If a considerable number of cases develop in a given vicinity, it is our policy to devote especial attention to the milk supply of that vicinity. During the past year I should say that we have had definite proof of the milk origin of about six such small local epidemics. The typhoid that spreads within a house from one member of a family to another, or from one occupant of a house to others, we believe to be due to flies and fingers.

W. A. Evans, M. D.,
Chicago, Nov. 6, 1908. Commissioner of Health.

THE FLY CAMPAIGN IN FLORIDA.

It gives me pleasure to send you under separate cover a "fly card"* which the State Board of Health of Florida has lately published and distributed. I think that you will discern from this poster the position of this board in regard to these disease-carriers, and as confirming the reports of Shakespeare, Vaughan and others as to the danger which the fly is as a constant menace to the public health in conveying the typhoid fever on its proboscis and feet.

Joseph Y. Porter, M. D.,
Key West, Fla., Nov. 5, 1908. State Health Officer.

DR. GOTTFRIED KOEHLER, CHIEF FOOD INSPECTOR OF DEPARTMENT OF HEALTH OF THE CITY OF CHICAGO, SAYS:

We have been actively engaged in a crusade against the transmission of this disease [typhoid] by flies during the past year. In 1902, when we had quite an epidemic of typhoid fever in this city, Dr. Alice Hamilton made some investigations on the above named question and came to the conclusion that flies were an important medium for the transmission of typhoid. Her article appeared in Vol. 40, "Journal of the American Medical Association," page 576. It was entitled, "The Fly as a Carrier of Typhoid." The work was done in the laboratory of the Memorial Institute for Infectious Diseases.

Chicago, Nov. 5, 1908.

*Reproduced opposite page 47 of this pamphlet.

FLIES CARRY GERMS FROM EXCRETA TO FOOD.

I have not been making any special investigations with regard to this matter, but am of the firm opinion that a large percentage of the cases of typhoid fever which cannot be traced directly to contaminated water, milk or other food products are caused by the infection of food by flies that have had access to some privy or place where the excreta of typhoid fever patients is present. The fact that from two to three per cent of all cases of typhoid fever are now recognized as being more or less chronic bacilli-carriers only emphasizes the danger. Even if every case was properly nursed, and the excreta properly disinfected during the active stage of the disease, the danger may still be present for months and even years in some cases. Flies having access to the excreta of such people become, of course, just as dangerous as if these people were actively suffering from the disease. Of course it is difficult to prove fly infection in specific cases. I have lately had brought to my attention four cases of typhoid fever in one family, in which the likelihood of flies carrying the disease is considerable. There is a privy vault on the premises, and the undisinfected excreta of the first patient were deposited in it. The other three cases were not taken sick for several weeks, and were all children who did not nurse the first case at all, and this case was removed shortly after the onset of the disease. Flies were very prevalent. We caught some of them and are making a bacteriological examination of them to see if we can find any typhoid fever bacilli. This work has not yet been completed and it is doubtful whether or not we will succeed in isolating the desired organisms. Of course a negative result will be of no significance.

With regard to my opinion as to the transmission of typhoid fever through polluted milk and water, there is no question that these two media are frequently the vehicle of the disease, but I could not give an opinion as to the percentage of typhoid fever contracted from milk and water and from fly infection.

Selskar M. Gunn, M. D.,
Orange, N. J., Nov. 4, 1908. Health Officer.

MOST WASHINGTON TYPHOID DUE TO FLIES.

In a public address before a convention of public health officers held in Oregon in 1902, I stated that too much stress was laid upon the pollution of water and not enough upon flies, as I believed the vast majority of cases were due to the latter. While I do not believe that either impure milk or polluted water is directly responsible for more than a very small portion of typhoid fever cases, and that the former opinion of considering these two articles the source of all cases was vicious, inasmuch as it has prevented proper investigations of other possible and probable sources of the disease, I do, however, think that both impure milk and polluted water supplies indirectly increase the number of typhoid fever cases, by the fact that both lower the resistance of the normal healthy person to this disease, and thereby enable the bacilli to thrive in cases where they would, ordinarily, with pure water and pure milk, not do so. They are also, in my opinion, capable of transmitting the typhoid bacilli in a small proportion of cases, and we should, therefore, be careful not to cause the pendulum to swing too far the other way, so that they will not be considered in connection with an investigation of this disease.

Elmer E. Heg, M. D.,
Seattle, Wash., Nov. 10, 1908. Secretary State Board of Health

AGENCY OF FLIES IN SPORADIC CASES OF TYPHOID.

That typhoid germs may be transmitted by flies has, it seems to me, been abundantly proved, especially in our experience during the Spanish-American War. That typhoid bacilli may be transmitted through impure milk and water supplies there is absolutely no question. The numerous epidemics of typhoid on record, proved to have been caused through both these agencies, are convincing beyond question. As to the cause of many so-called sporadic cases, the source of which is generally not discovered, I am of the opinion that flies may be one of the prolific factors, but to what extent is a matter of conjecture.

Concord, N. H., Nov. 4, 1908. IRVING A. WATSON, M. D.

FROM THE SECRETARY OF THE DELAWARE STATE BOARD OF HEALTH.

This Board has always acknowledged the grave dangers of polluted water and milk supplies, and in all epidemics has especially investigated these acknowledged sources of infection. My individual opinion as to the transmission through the medium of flies is that they are common carriers of typhoid bacilli. Of course typhoid fever is with us when Jack Frost has sent the fly to his winter quarters. A. E. FRANTZ, M. D.

Wilmington, Del., Nov. 7, 1908.

FLIES MORE DEADLY THAN SPANISH BULLETS.

The communicability of typhoid fever through the medium of the house-fly has interested me ever since the Spanish-American War. I have made a compilation of figures regarding typhoid fever as we saw it then. It shows that of 133,513 men, 22,420 had typhoid fever, from which 1,924 died; the number of deaths from all causes was 2,197. Comparing this with the experience of the Twenty-third Regiment, U. S. Infantry, encamped at the Jamestown Exposition grounds for six months in the summer of 1907, we have an object-lesson that should be known to all. The latter organization had only about two per cent of sickness of all kinds, virtually had no flies or mosquitoes, though living on swampy ground only ten feet above ocean level. Reports of its experience can be found in copies of the "Military Surgeon" for the latter part of that year. In this locality we have had rather more than our usual number of fall typhoid cases, in persons who have had their summer outings in tents and in attendance at camp meetings.

D. S. BURR, M. D.,
Binghamton, N. Y., Nov. 8, 1908. Health Officer.

FLIES SPREAD TYPHOID MORE RAPIDLY THAN MILK OR WATER.

During the past summer there were some two hundred cases of typhoid directly traceable to the water supply contaminated by sewage, the foci of infection following plainly the line of the water mains so infected. In none of these cases (except in so far as the fly may have played an important part in transferring the contagion from patient to patient in food products, etc.) could the fly be charged with having carried the original infection. On the other hand, the writer, who was then surgeon of the Thirteenth United States Infantry, can positively state that the outbreak of typhoid fever in the army camps at Mobile

and Tampa in the spring and summer of 1898 was directly traceable to the fly as the chief and practically only medium of transmission of the disease.

The facts given above would indicate my opinion as to the transmission of the disease through polluted milk and water supply. I am inclined to the opinion, however, that, once started in a community through any original source, the danger and liability of extension of the disease through the medium of the house-fly is incomparably greater than from polluted milk or water only, without the fly.

WILLIAM B. WINN,
Assistant Health Commissioner.

St. Louis, Mo., Nov. 6, 1908.

FLIES JOINTLY RESPONSIBLE WITH POLLUTED WATER AND MILK.

I am firmly convinced from the experiments of others and my general observation and knowledge of the habits of the fly that it is a factor of considerable importance in the spread of such diseases as typhoid fever. I am certain from investigations of epidemics which I have made in Iowa and from my knowledge of the investigations of epidemics made by other competent and reliable men, that epidemics of typhoid fever are often the result of polluted water supplies and frequently, also, of milk that has been polluted either by water or more directly by individuals who carry typhoid bacilli with them. I certainly believe that milk and water represent a far more important source of infection than flies.

HENRY ALBERT, M. D.,
Director Hygienic Laboratory, Iowa State University.

Iowa City, Nov. 10, 1908.

FLY-BORNE TYPHOID VERY FREQUENT IN VIRGINIA.

I believe that very few of our typhoid epidemics in Virginia are caused by polluted water or milk. Flies certainly play a very large part in the epidemiology of the disease. This department will be glad to furnish you any further information in regard to the matter that you may desire, or co-operate with you in any investigation of the matter. The small local epidemics in Virginia towns offer very inviting fields for the study of typhoid, and it is the purpose of this department to put several men on the problem next summer.

ALLEN W. FREEMAN, M. D.,
Assistant State Health Commissioner.

Richmond, Va., Nov. 9, 1908.

FLIES SHOULD BE KEPT FROM SEWAGE.

I have had occasion to investigate a number of typhoid outbreaks in this State, some of which I have attributed to flies, although perhaps no more frequently than to impure milk and polluted water. Flies, milk and water I consider the common causes of the disease, and believe the fact that typhoid fever is most prevalent at the season of the year when flies are most numerous is significant. Since we know that two or three per cent of all persons who have had typhoid fever become chronic bacilli carriers, and that there are many walking cases of the disease which go unrecognized, it is evident how important is the proper disposal of sewage, so that it cannot be accessible to flies or be carried by heavy rains into our springs and water supplies. The proper disposal of sewage and excrement is the most important question in the prevention of typhoid fever.

JOSEPH H. TOWNSEND,
Secretary State Board of Health.

Hartford, Conn., Nov. 6, 1908.

FLIES AN IMPORTANT FACTOR IN MARYLAND TYPHOID.

I firmly believe that flies are an important factor in the dissemination of typhoid in our State. Unsanitary conditions which exist around the homes of the general public, especially in the country districts, make the control of this pest of paramount importance.

I was interested yesterday to hear a discussion by Dr. C. W. Stiles, of the Marine Hospital Service, Washington, D. C., at the first meeting of the Commission on Country Life. He stated that typhoid fever was distinctly a farm disease, from an extended investigation that he had conducted throughout the Union in comparing the number of cases in the country and in the city. It was also shown that typhoid fever was more prevalent in those States where flies were present for a longer period throughout the year and reproduced more rapidly. He stated that in the majority of farmers' homes that he had visited in the South there were no privies, especially for the laboring class, and that in districts where the negro population was greatest this disease was more prevalent among the whites.

Congratulating you upon the great work that you are accomplishing, I am,

Very truly yours,

THOMAS B. SYMONS,
State Entomologist.

College Park, Md., Nov. 10, 1908.

NO DISPUTE AS TO TRANSMISSION BY FLIES.

This department is satisfied that typhoid bacilli in drinking water and milk are a common source of infection. We have had two or three typhoid epidemics through the milk in this State during the last twelve months. That flies transmit the disease I think cannot be disputed, given the necessary conditions and their access to typhoid excreta and to food. I think that the deductions obtained from the investigations at Camp Wyckoff at Montauk Point, after the Spanish War, was an illustration which came very close to our doors.

GARDNER T. SWARTS, M. D.,
Secretary State Board of Health.

Providence, R. I., Nov. 9, 1908.

"COMMON CARRIERS" OF TYPHOID BACILLI.

It is the opinion of this Board that polluted milk and water supplies are the main sources of typhoid fever in localities where sewers are in use. Where infected fæces or urine are deposited in open places or vaults we believe that flies act as common carriers of the typhoid bacilli.

GUSTAVUS A. BADGER,
Clerk Board of Health.

Lynn, Mass., Nov. 18, 1908.

FROM THE HEALTH DEPARTMENT OF OAKLAND, CAL.

This Health Department has made no investigations to establish the possibility of fly transmission of typhoid, but it is our belief that the fly is a frequent carrier of the agents of infection in typhoid as well as several other contagious diseases. We believe, however, that the common mode of transmission is by drinking water polluted with sewage; and we know that certain epidemics have occurred through pollution of milk with the typhoid bacilli at the dairy. The epidemic of a few years ago in our neighboring city of Palo Alto was directly traced to milk pollution.

E. W. EWER, M. D.,
Health Officer.

Oakland, Cal., Nov. 12, 1908.

MICHIGAN TYPHOID CASES TRACED TO FLIES.

We have some data bearing on the agency of flies in the spread of typhoid fever, thirty-eight cases having been reported as traced to flies, together with some data relating to precautions exercised toward exclusion of flies from the sick room of a typhoid fever patient.

Because the recognition of flies as an agency in the spread of typhoid fever and tuberculosis is of such recent growth, and because we have meagre data on which to base an opinion, I fear I cannot give you much assistance on this point; but at the same time I may say that I do not doubt that flies are a greater agency in the spread of these two diseases than we can at present say. I am not ready to subscribe to the belief that they are of greater importance than either water or milk.

F. W. Shumway, M. D.,
Secretary State Board of Health.

Lansing, Mich., Nov. 17, 1908.

FLIES A DANGER IN PUBLIC INSTITUTIONS.

It has been my observation in our institutions that the scattering cases of typhoid are mostly traceable to milk and especially the water supplies. In schools (industrial, blind, etc.) prisons, soldiers' homes, etc., when large outbreaks have occurred after single cases it has usually been traceable to flies. Usually the cause of the first case is uncertain.

Louis Leroy, M. D.,
Bacteriologist.

Memphis, Tenn., Nov. 19, 1908.

GENERAL BENEFIT OF ANTI-FLY CAMPAIGNS.

I have always considered the fly a potential danger which varies greatly under different conditions. Just how much disease to attribute to this insect pest in the aggregate would be a difficult matter to estimate. I believe that the movement for the restriction of the fly nuisance a good one; for whatever makes for cleanliness by the prompt removal of filth and refuse from our environment and its ultimate distruction as a breeding ground for flies opposes to a certain degree the transmission of many other disease germs than those which the fly presumably carries.

Theobald Smith, M. D.,
Harvard University Medical School.

Boston, Nov. 13, 1908.

FLIES RESPONSIBLE FOR A LARGE PERCENTAGE OF TYPHOID CASES.

The Board of Health of this city has always held the common house-fly responsible for the transmission of typhoid in a large percentage of cases. The annual report of the Board of Health for the fiscal year ending July 1, 1907, describes experiments that conclusively prove the house-fly responsible for practically 151 cases of typhoid fever subsequent to the great earthquake and fire.

W. C. Hassler, M. D.,
Chief Sanitary Inspector.

San Francisco, Nov. 23, 1908.

TYPHOID DEATH-RATE CUT IN HALF BY FLY CAMPAIGN.

We have been making strenuous efforts to protect the homes of this city against flies. I am very glad to state that the death-rate from typhoid fever, with

the same water supply, has been more than cut in half so far this season. We believe that work along these lines has produced remarkable results. However, it is but fair to say we have been making strenuous efforts to put the city in better sanitary condition in other respects. Our milk supply has been carefully watched, as has the ice supply. We believe, nevertheless, that keeping the flies from our homes has produced very important results.

J. E. Crichton, M. D.,
Seattle, Wash., Oct. 21, 1908. Commissioner of Health.

MILK INFECTED THROUGH FLIES.

In my opinion flies are responsible for more transgressions along the lines stated than people at present appreciate, especially as relates to typhoid fever. I am convinced that in many instances typhoid-infected milk results from contamination through flies. There was a notable example of this within my observation two or three years ago in which the circumstances seemed to prove that the milk produced by a small dairy, which was responsible for typhoid fever in twenty-six families, was infected by contact with flies. At a previous time there had been a case of typhoid on the premises and the excreta had been deposited in a privy vault without having been disinfected.

T. B. Beatty,
Salt Lake City, Utah, Nov. 27, 1908. Secretary State Board of Health.

FROM THE MAINE STATE BOARD OF HEALTH.

Basing our opinion upon the statements of other persons outside of our members, we believe that flies constitute a serious source of danger when they have access alike to typhoid infection and food supplies. While I am not in a position to make any positive statements on this point, my personal belief is that infected milk and infected water supplies are far from being an inconsiderable cause of typhoid fever.

A. G. Young, M. D.,
Secretary.
Augusta, Me., Nov. 5, 1908.

CINCINNATI'S EXCELLENT TYPHOID RECORD.

Cincinnati has had a most interesting experience during the last year. During the month of October, 1908, there were but thirty cases of typhoid reported, notwithstanding that this disease was practically epidemic throughout the entire valley, and the low state of the Ohio River (the lowest in many years) had made it practically an open sewer. The fact that Cincinnati has not experienced the worst epidemic of typhoid in its history I ascribe to the wonderful work of our newly completed municipal water works. Of these thirty cases reported in October, fully one-half were children, for the most part infants. From this it can be readily inferred either that infection occurred through the milk supply or that in children there is a susceptibility to the typhoid germ. Personally I believe that it is due to a polluted milk supply, as the milk conditions of our city are truly deplorable. In Newport, Kentucky, there have recently been over thirty cases of typhoid fever traced to one dairyman. While I recognize the agency of flies in the conveyance of typhoid, also the possibility of the contagiousness of the disease, yet I believe that the large majority of cases are due to polluted drinking water.

Mark A. Brown, M. D.,
Cincinnati, Nov. 12, 1908. Health Officer.

UNITED ACTION AGAINST THE FLY IN MASSACHUSETTS.

I have in hand your note of the 3rd inst., with reference to flies and typhoid fever. It is a pleasure to report to you from two sources, the Health Department and the special committee of the Massachusetts Association of Boards of Health. From the former Board I may say that no definite plan of warfare has been adopted. The matter has been under consideration for a long time, and it is through the action of the Boston Board that the Massachusetts Association has taken up the matter. The reason for this is that it seemed as if the different boards could better take up the matter with a uniform policy, rather than with a different one for each few square miles of territory. Any successful war, therefore, would not only affect the immediate territory interested, but would be a factor towards the immunity of neighboring communities. With reference to the Health Department of the City of Boston, I may say that the attitude is conservative. We know that the fly can carry infection, but we are utterly unable to say to what extent. We have been able, in most of our epidemics, to trace the infection to milk or the well-water with which the utensils were washed. In our latest cases it was an employee on the milk farm or at the dairy. The drinking supply in the larger cities of Massachusetts is pretty well guarded, so that we do not now look for much typhoid from that source. On the contrary, the country supplies are not well guarded. We are regarding the infection by the means of flies as possible, and as a factor to the spread of the disease, but we consider it as yet not to be a major factor, and believe that the milk infection is much more dangerous.

In July the Massachusetts Association appointed a committee to consider the fly nuisance. This committee included Dr. C. V. Chapin, of Providence, chairman; Dr. Charles E. Simpson, of Lowell, Dr. Lyman A. Jones, of North Adams; James C. Coffey, of Worcester, and John Ritchie, Jr., of Boston. A printed circular* prepared by Dr. Chapin, used by him in his Providence work, was presented by the Committee at the meeting of the Massachusetts Association, and it was voted to continue the committee and empower it to secure the distribution of the circulars during the winter and early spring, so as to catch the next fly season in advance.

JOHN RITCHIE, JR.,
City Health Commissioner.

Boston, Nov. 6, 1908.

A CANADIAN OPINION.

I can refer you to no investigation *in re* transmission of typhoid fever by the medium of flies. However, I believe them to be one cause of its propagation, none of the others being excluded, among them the well known source of infection by the medium of polluted water supply.

E. PELLETIER, M. D.,
Secretary, Board of Health, Province of Quebec.

Montreal, Canada, Nov. 4, 1908.

TWO WATER-BORNE EPIDEMICS IN OREGON.

We have made no investigation of the transmission of typhoid fever by flies, although it is the opinion of our board that this is one of the most important ways. With regard to the transmission of typhoid fever by impure

*Reproduced on page 46 of this pamphlet.

milk and polluted water supply, I will say that we have had two serious epidemics in this State, one occurring at Eugene in 1905, in which the water supply was polluted directly from the sewer system, and another occurring at The Dalles, Oregone, in which the infection was traced to the water supply. Bacteriological examination of this water demonstrated the presence of fæcal infection.

ROBERT C. YENNEY, M. D.,
Portland, Ore., Nov. 7, 1908. State Health Officer.

FROM DR. L. R. THURLOW, HEALTH OFFICER OF PLAINFIELD, N. J.

Thus far this year we have had two distinct outbreaks of typhoid fever. The first was in August, and there were eight cases at the time, all of which were in one neighborhood. The second was in October, when eighteen cases were reported. In both of these instances the importance of transmission of the disease by flies was carefully considered. The first outbreak occurred in a good portion of the city; there were no vaults or cesspools, and the houses were all well screened. The second outbreak was not confined to any one locality, and the indications seemed to indicate a milk infection. We were, however, unable to find any possibility of infection on the dairy premises, or in any part of the transportation or delivery of the milk.

In regard to the transmission of typhoid fever by impure or polluted water compared with the transmission of flies, my experience points to water as the most important source of infection; second to this, milk.

Plainfield, N. J., Nov. 20, 1908.

A MILITARY CAMP EPIDEMIC CAUSED BY FLIES.

At the time of the Spanish-American War the Fifteenth Minnesota Volunteers, encamped at the Fair Grounds, suffered an epidemic of typhoid. The State Board of Health investigated the epidemic and published their findings in their annual report. This epidemic was shown to have been spread by flies, and so far as I know was the first epidemic of typhoid studied from that point of view. There is no doubt that typhoid is spread by means of an impure milk and water supply, though no epidemics have been traced to that cause here, as our water and milk supply is excellent.

J. M. ARMSTRONG, M. D.,
St. Paul, Minn., Nov. 27, 1908. Assistant Commissioner of Health.

FLIES MOST DANGEROUS IN CAMPS.

The writer is of the opinion that flies play no part in the present increase in cases of typhoid in this city, as the increase began during March, and the decrease during the summer months. During the past summer, which was extremely dry, there was a decrease in the number of cases, but I am expecting more trouble as a result of the present and future rainfalls. I am of the opinion that flies play a very important part in spreading the disease under certain conditions, such as prevail in camps where sanitation is imperfectly maintained. Milk is such an excellent culture for germs that it is easily contaminated if placed in cans washed in water containing typhoid, or if exposed to an atmosphere contaminated with germs of scarletina or diphtheria. This is too well known, doubtless, to require mention.

R. W. ROBINSON, M. D.,
Auburn, N. Y., Nov. 20, 1908. Health Officer.

CASES CASTING SUSPICION UPON FLIES.

At the request of Mr. E. S. Allen, I am forwarding certain information in regard to cases of typhoid fever at the "Mountain House Property" in this village. John Flannery—age twelve years—had been sick some two weeks; no doctor in attendance; was removed to St. Mary's Hospital on November 23; typhoid fever. He had been visiting in West Orange and Millburn about a month before removal. Own water supply and own milk supply. No milk or water used on premises except own supply. No oysters used. At this date the rest of the family were in perfect health. On October 5, Willie—age thirteen years—and Leo—age eight years—were removed to Memorial Hospital. Annie—age six years—was not feeling well, but was not sick enough to stay in bed. On October 24 Annie was removed to Memorial Hospital. Sample of water examined showed but slight amount of organic matter, probably due to leaves in spring. Flies were then caught in a cage placed in the closet in which milk, cake and bread were kept. Colon bacilli have been isolated from the feet of these flies. Up to the present we have been unable to get typhoid bacilli, but probably may be able to identify. The house was swarming with flies. The privy, standing seventy-five feet from unscreened window, contained numerous flies. There was a direct connection between the room in which the food closet was situated and the unscreened window. Although these people were told after the first case to kill all the flies and to disinfect the privy, there was no evidence that anything had been done. The board cleaned the house, floors, etc., killed flies and disinfected the privy after October 15.

A. C. Benedict,
South Orange, N. J., Nov. 23, 1908. Health Department Inspector.

PITTSBURG SUFFERS MOST FROM WATER.

During the past year typhoid fever sank to about one-fourth its previous prevalence. We had an increase in August in about the usual proportion. There is one reason why the great epidemic prevalence of typhoid fever in Pittsburg cannot be explained by flies, and that is that we have almost as much typhoid fever in the cold weather as in the warm. It is also true that where houses are not connected with sewers the methods of disposal of excreta do not favor the access of flies, owing to darkness. I do not mean by this expression to assert that flies have nothing to do with the dissemination of typhoid fever during the warmer months, but they certainly do not cause the excessive typhoid fever rate which we have been accustomed to until the past year.

E. T. Matson, M. D.,
Executive Officer Typhoid Commission, Bureau of Health.
Pittsburgh, Pa., Nov. 17, 1908.

FROM DR. JAMES BOSLEY, HEALTH COMMISSIONER OF BALTIMORE.

We are familiar with the report of Dr. Jackson and indorse the conclusion that the common house-fly is a possible carrier of disease under certain conditions. As far as Baltimore is concerned, we have as yet had but little evidence that the fly has been directly concerned in the transmission of typhoid fever, which we believe, however, to be due more to the fact that the fly has not been in contact with typhoid stools, than to its inability to carry the organism

PRIVY VAULTS, SWARMING WITH FLIES, ADJOINING KITCHEN DOOR
These conditions, inviting disease and insuring the pollution of food, are practically duplicated in hundreds of towns besides Pittsburg, in which this photograph was taken.
By courtesy of *The Survey*

FLY ON PIECE OF SPONGE CAKE
His last promenade may have been over unmentionable filth in the neighborhood of the dining room.
Photograph by W. L. Underwood.
(Permission of Doubleday, Page & Co.)

if infected. At present we consider that typhoid fever in Baltimore is mainly due to the transmission of polluted milk and polluted water. In our judgment transmission of typhoid fever by flies must be very much less than transmission by milk and water.

Baltimore, Md., Dec. 5, 1908.

A NON-COMMITAL REPORT.

We have made no investigations, but feel very positive that flies play a most important part in the transmission of typhoid and other germs. As to the relative importance of flies and milk or water, we have no positive information.

C. C. Lytle, M. D.

Geneva, N. Y., Dec. 5, 1908.

TYPHOID IN MINING CAMPS.

I know of no cases in the State of Wyoming where typhoid fever was transmitted by flies, although there may be many cases, were they investigated, due to that means of transmission. I do know that we have typhoid fever in two localities in the State of Wyoming—mining districts—where the disease is epidemic on account of polluted water supply for domestic purposes. This has been investigated on two or three occasions.

Amos W. Barber,

Cheyenne, Wyo., Dec. 7, 1908. Secretary State Board of Health.

A SCREENING MOVEMENT IN GALVESTON.

Our Health Department, by dint of having all cisterns screened, standing water drained off or coated with petroleum, all cesspools in the outlying, unsewered districts, and all barrels, etc., held in the cotton yards for fire extinguishing purposes, treated with crude carbolic acid, has practically exterminated the mosquito. The treating of cesspools with crude carbolic acid and the enforcement against permitting accumulation of manure, etc., has very materially lessened the fly pest.

We are now preparing an ordinance compelling the screening of all kitchens, pantries, dining-rooms, etc., in all hotels, boarding houses, restaurants, etc., and butchers' and fishmongers' shops, fruit stands and wagons, and I could use your promised literature to very good advantage in popularizing this screening movement.

C. W. Trueheart, M. D.,
Health Officer.

Galveston, Tex., Dec. 2, 1908.

MONEY NEEDED FOR TEXAS INVESTIGATIONS.

In reply to yours of the 30th ult., will state that this department has not been making any investigations with regard to the transmission of typhoid or other germ diseases by flies. I hope your committee will be successful in arousing more universal interest in this matter, and particularly awaken our section and our Legislature to the necessity for more money and more authority in investigation and research along these lines in our State.

William M. Brumby, M. D.,

Austin, Tex., Nov. 9, 1908. State Health Officer.

THE FLY ONE OF THE GREAT TYPHOID-SPREADING AGENCIES.

I have made no investigations as to the transmission of typhoid by flies, other than in a general way, but I think that this is one of the great means. Dairies often spread the disease, as does polluted water, but these are not the sole causes. Direct contact and house infection are also means of transmission. In fact, I recognize any means which transmits the germs from one person to another. I consider milk and water as two of the great means of producing epidemics.

L. M. Powers, M. D.,
Health Officer.

Los Angeles, Cal., Nov. 8, 1908.

FROM THE HEALTH OFFICER OF ALBANY, N. Y.

In my judgment abundant evidence exists as to the medium of flies as a means of transmission of germ diseases, and every effort should be made by the various political divisions of the State and by individuals and societies to prevent the propagation of flies, by the proper care of manure and other breeding sources. During the fly season efforts should be made in localities in which flies are common to prevent their ingress into houses and their proximity to the food supply. While the evidence seems to be sufficient that germ diseases may be transmitted through flies, it is extremely doubtful whether flies are often or ever the means of transmission of typhoid fever. I know of no investigations showing the relation of cause and effect between typhoid fever and the common house-fly. I do not believe, however, that flies are a common source of origin of typhoid fever. The evidence appears to be indisputable that typhoid fever is a water-borne disease and that polluted water is still the most active, the most prominent and the most serious cause of the propagation of typhoid fever. Enough is known also to render it certain that a minority of the cases of typhoid fever arise from a polluted milk supply.

Joseph D. Craig, M. D.,
Health Officer.

Albany, N. Y., Nov. 11, 1908.

SEWAGE THE MOST COMMON MEDIUM OF INFECTION.

I have read the very interesting report of Dr. Jackson and consider that it contains matter for serious thought. It is my opinion that typhoid can be transmitted in several ways, and that in the majority of instances it is media other than flies that constitute the greatest source of danger. As to the principal method, with the ever-increasing amount of sewage in the public water supplies, it seems to me that this is the most common medium. That flies do transmit typhoid bacilli, I think the experience of our Spanish-American War fully establishes.

William G. Prince,
Bacteriologist Department of Health.

Buffalo, N. Y., Nov. 9, 1908.

DANGER OF FLIES IN AUTUMN.

I am of the opinion that a great deal of disease is carried by house-flies, especially in the fall of the year, when people are prone to remove their screens too early, with the drying up of the grasses and other vegetable matter. Probably the germs that repose in these media are carried into houses when no obstructions are offered.

F. J. Patton,
Health Commissioner.

Duluth, Minn., Nov. 10, 1908.

FLIES HELD TO BE "PROBABLE FACTORS" IN TYPHOID TRANSMISSION.

Though this bureau has made no special investigations of flies as carriers of disease, we have, nevertheless, looked upon them as probable factors in such transmission. We have accordingly enforced, in so far as it was possible, regulations aiming to protect food-stuffs exposed for sale, against flies, and to educate people in the matter of excluding flies from their houses, pantries, etc. As to the roles played by polluted milk and water in the dissemination of typhoid fever, permit me to say that our opinion upon this point is fixed and based upon what we regard as absolutely convincing argument. Until the introduction of filtered water in the city of Philadelphia we were notorious as a typhoid center. With the introduction of filtered water in this city typhoid fever has been practically eliminated from those districts receiving that water, and its elimination progresses with the extension of the system carrying purified water. On the milk question, we have on our records several cases in which typhoid fever was conveyed by milk, as convincing as circumstantial evidence could make them.

A. C. Abbott,
Chief Bureau of Health.

Philadelphia, Pa., Nov. 5, 1908.

HOUSE-FLIES UNDOUBTEDLY CARRY TYPHOID GERMS.

It has been proved beyond a question of doubt that typhoid fever may be transmitted by the common house-fly. That the disease may be acquired through polluted milk and water is a well-established fact. It is difficult to say which of the causative factors indicated is responsible for the greater number of cases of typhoid fever. However, but few sanitarians, in my opinion, will subscribe to the statement that typhoid infection from milk and water is insignificant as compared with that through the agency of flies.

James A. Egan, M. D.,
Secretary State Board of Health.

Springfield, Ill., Nov. 3, 1908.

DIFFICULTY OF TRACING FLY INFECTION.

The experience of this department, covering five years, and the investigation of 5,808 cases of typhoid fever, have indicated their distribution as to causation as follows:

Cases imported into the District of Columbia, of unknown origin, 940.

Cases of local origin:

Contact cases	366	7.51 per cent.
Due to milk	135	2.77 per cent.
Of unknown origin	4,367	89.72 per cent.

Some of the cases of unknown origin are doubtless due to polluted water, and some are probably due to flies. It is very difficult, however, to trace infection by flies with any degree of accuracy. Such observations as have been made by this department indicate that the extent to which flies act as carriers of typhoid fever infection is much exaggerated. In view of the possibilities, however, of the dissemination of disease through these pests, the Health Department is doing whatever it can to diminish the number of flies in the community and toward preventing them from contaminating food products.

William C. Woodward, M. D.,
Health Officer.

Washington, D. C., Nov. 9, 1908.

UNDECIDED AS TO TYPHOID SOURCES.

I have not made any investigations as to typhoid transmission by flies. As to typhoid transmission by milk or water, here in Galveston the city water is artesian well-water mainly, and typhoid from water infection can almost be excluded, only a few wooden cisterns being used. During the past summer there were a number of mild cases of typhoid in Galveston which were attributed to the distribution of the germs by flies, but as to whether the flies were the real carriers or not was not worked out.

M. A. Wood.

Galveston, Tex., Nov. 14, 1908.

IMPORTANCE OF PROPER DISPOSITION OF TYPHOID DISCHARGES.

Replying to your letter of November 4, I would say that I have not made any investigations personally with regard to the transmission of typhoid germs by flies, but it stands to reason that this is one of the many methods of disseminating typhoid fever. Replying to your further inquiry, I would say that I think it a great practical and theoretical error to attempt to lay special stress upon any one means of transmission to the exclusion of the many other means which exist; not only can typhoid fever be transmitted by flies, but also by milk, water and other means. It seems to me that in general it would be well to emphasize the important fact that the infectious material is found in concentrated form in the discharge; hence, when this is properly disposed of, the work of safeguarding against typhoid is reduced to a minimum.

C. W. Stiles,

Chief Division of Zoology, Public Health and Marine Hospital Service.

Washington, D. C., Nov. 5, 1908.

FLIES AS ACTIVE AGENTS IN TRANSMITTING TYPHOID.

We have made no special investigation with regard to transmission of typhoid and other germ diseases through the medium of flies. We have realized, however, that undoubtedly the common house-fly has been an active agency in the transmission of disease, and in our lectures emphasize the danger of such transmission and the necessity of eliminating, as far as possible, this factor. In regard to the transmission of typhoid fever and the forces bringing this about, experience proves to us that milk and polluted water are undoubtedly very active agencies. We have had in recent years two milk epidemics of typhoid fever. In one case we traced 116 cases of typhoid in the city of Port Washington to a dairyman who had typhoid in his own family. One hundred and fifteen of these cases were using milk from this man. One patient did not receive his milk from this source, but was a frequent visitor of a restaurant where milk was obtained from this dairyman. This epidemic was in the early autumn and, strange as it may seem, there were no other cases of typhoid fever at this time in this city, with a population of about 5,000. We have just had an epidemic of typhoid fever in the city of Sheboygan, due to polluted water from Lake Michigan, precipitated probably from a large leak in one of the intake pipes and a defect in the wall of the well connecting with a flue extending to the lake shore some twenty feet away. The epidemic at Sheboygan was not confined, however, entirely to the users of water furnished by the water company. It was more or less distributed throughout the city in the homes

of well-water users, but largely confined to the adult population who were active business people and liable therefore to obtain drinking from various points throughout the city. The fly here may have been a factor in the transmission of this disease. I cannot believe that the transmission through infected milk and water is insignificant in comparison with other agencies. My observation leads me to believe that these are fundamentally the dangerous factors. We are examining much well water and water furnished by a water system in the smaller localities, and in a large percentage of our investigations we find polluted water in those localities where typhoid is reported.

C. A. Harper, M. D.,
Madison, Wis., Nov. 6, 1908. Secretary State Board of Health.

SPORADIC CASES OFTEN DUE TO FLIES.

There is no question in my mind but that severe epidemics of typhoid, outside of hospital or army quarantines, are nearly all due to the milk or water supply. Sporadic cases and epidemics often have their origin by the germ having been carried by the fly. Dr. Ralph W. Cornell,
Health Commissioner.

Omaha, Neb., Nov. 6, 1908.

FROM DR. G. A. BADING, MILWAUKEE'S HEALTH OFFICER.

There can be no question of the possibility of transmission of typhoid bacilli by means of flies, particularly in districts where sewage facilities are not provided and where, consequently, the old-fashioned vaults are still in use. This is not the case in our city, and for that reason the particular subject of transmission of typhoid by means of flies has not concerned us to any extent. We have had several instances where mild typhoid epidemics in particular localities were unquestionably due to an infected milk supply, and only last year had a nest of typhoid cases which we traced to polluted water, there being a shallow well from which the water supply had been furnished. On investigation, the well water was found polluted to such an extent as to lead us to ascribe the outbreak to that source.

Milwaukee, Wis., Nov. 7, 1908.

EXPERIENCE OF A NEBRASKA ENTOMOLOGIST.

In reply to your communication of November 4 regarding the transmission of typhoid and other diseases by flies, I wish to report as follows: I have never made any specific experiments along the line suggested, but have carefully compiled statistics and other accounts that have led me to believe that the house-fly (*Musca domestica*) and several of its allies are responsible for varying percentages of germ diseases that attack human beings. These percentages depend upon conditions and circumstances that vary among themselves. In the case of the work of Dr. Jackson, with which I am acquainted only through the report which was issued July last, it can be seen that flies caused a very large percentage of the contamination. I believe that under certain conditions the typhoid germ can be and is transmitted by the contamination of drinking water, milk, etc. A number of years ago our family had a siege of typhoid fever. Eight members suffered attacks from the disease. We had just moved into a new country and used river water for domestic purposes. Our

parents and grandparents drank tea and coffee and escaped the contamination, while seven children and a servant drank water. All of those using water came down with typhoid in due time. Other persons in the small town contracted the disease also. Investigation revealed a case of the disease ten miles up stream some weeks previously, where the sewage from the sick room was thrown into the river. Other cases likewise occurred further down stream. Cases of typhoid have been traced to the use of milk right here in Lincoln, both where the disease occurred in the family of the milk man and where germs of the disease were found in the well-water used in washing milk cans. Of course in some of these last named instances the flies might readily have been the agency for spreading the bacilli.

LAWRENCE BRUNER,
State Entomologist.

Lincoln, Neb., Nov. 7, 1908.

FROM DR. F. H. PECK, HEALTH OFFICER, UTICA, N. Y.

While we have never made any investigation in regard to the transmission of typhoid and other germs through the medium of house-flies, we have no doubt that this is a frequent cause of infection. As to the transmission through impure milk, it is generally conceded that the only impurities of milk that will carry are its infection through impure water supply, either through adulteration or the use of water in washing milk utensils. We believe that the most potent source of typhoid infection is polluted water.

Utica, N. Y., Nov. 7, 1908.

MILK FREQUENTLY INFECTED BY FLIES.

We have been able to trace one small epidemic of typhoid to a city dairy where in our opinion the milk was infected by flies which had received the infected organism from an overflowing vault. In this city typhoid is uncommon; the cases which occur from polluted water are few and are limited to the users of surface wells. It has for some time been the opinion of this department that typhoid in Fort Wayne was chiefly the result of infected milk, of flies and of contact infections; but the exact relationship existing between these factors we have been unable to determine. It is to be borne in mind, however, that milk is frequently infected by flies.

H. O. BRUGGERMAN, M. D.,
Secretary Board of Health.

Fort Wayne, Ind., Nov. 7, 1908.

TYPHOID AND "CARRIER" CASES.

My opinion is that, while flies may be a factor of some moment, in such places as military, lumber or mining camps, under ordinary conditions which prevail in our cities flies have little part in the spread of typhoid fever. It does not seem to me that the evidence printed by your committee was at all conclusive. As regards water infection, I believe that in very many communities a large amount of typhoid fever—in some cities, most of it—is caused by contaminated water. In such cities as New York and Providence I believe that practically no typhoid fever is due to infected water. I doubt if milk causes much typhoid, except in the way of sharp outbreaks. On the whole, perhaps 5 to 10 per cent. of our typhoid fever may be considered to be due to milk, though I rather incline to the smaller figure. In cities with a good water

supply and few privy vaults, like New York and Providence I believe that by far the larger part of the typhoid fever is caused by contact infection, and that "carrier" cases are an extremely important factor in its spread.

CHARLES V. CHAPIN,
Superintendent of Health.

Providence, R. I., Nov. 4, 1908.

FROM DR. SAMUEL A. DIXON, PENNSYLVANIA'S HEALTH OFFICER.

In answer to your letter of the 2nd inst., I beg to say that the statistics of the world show that water is responsible for the transmission of typhoid fever more than anything else known, and I believe impure milk is a close second.

Harrisburg, Pa., Nov. 5, 1908.

FROM THE STATE HEALTH OFFICER OF ALABAMA.

While I am satisfied that flies play an important role in transmitting typhoid fever, and possibly other diseases, yet I am satisfied that typhoid fever is not infrequently transmitted through polluted milk and water.

W. H. SANDERS, M. D.,

Montgomery, Ala., Nov. 4, 1908.

ALL THREE CAUSES OPERATE IN MARYLAND.

The question of the relative importance of the fly in transmitting typhoid fever is only to be determined by the importance of other hygienic factors. With an extremely bad water supply, transmission by flies and milk becomes relatively unimportant. When the water supplies are improved, we find a larger proportion of cases due to infected milk, direct contagion, and the action of flies. I regard winter typhoid fever as due almost exclusively to water. I do not consider that there is any warrant for the statement that all other causes of transmission of typhoid are insignificant as compared to that contracted through the medium of flies.

MARSHALL L. PRICE, M. D.,
Secretary State Board of Health.

Baltimore, Md., Nov. 4, 1908.

MONTCLAIR, N. J., HAS ABOLISHED VAULTS.

Owing to the small number of cases of typhoid fever that we have in a community of this size, local investigations would be of slight value. In order to prevent the spread of this disease by flies we have abolished practically all of the privy vaults in town, and have declared all such vaults to be a nuisance, by ordinance. We also try to secure proper screening of houses in which there is typhoid fever. I hardly see how there can be any question of the danger of transmission of typhoid fever by the use of impure water and milk, for they can become contaminated by the specific germs at any time, and the epidemics that have been traced to infected milk and water supplies are extremely numerous.

C. H. WELLS, M. D.,
Health Officer.

Montclair, N. J., Nov. 13, 1908.

FROM THE MASSACHUSETTS BOARD OF HEALTH.

Of eighteen local outbreaks of typhoid fever in different parts of Massachusetts, investigated under the direction of Dr. Charles Harrington, late secretary of this board, during the years 1905 and 1906, fourteen were traced to milk and three to polluted private or semi-private water supplies. One could not be explained. In eleven of the fourteen outbreaks traced to milk, there was a history of typhoid fever at the place of production, and in the others there was none. Dr. Harrington's opinion of the matter, stated in his own words, is as follows:

"With suitable State supervision of milk production, under which it would be unlawful under heavy penalty to ship milk from dairies where typhoid fever or other diseases, communicable through milk, are known to exist until the authorities are satisfied that it can be done with entire safety, such outbreaks could be largely prevented; but under the most practicable and efficient supervision there will be milk-borne typhoid outbreaks which cannot be traced to any antecedent case on the farm. This is because in any community in which typhoid is endemic, there exist numbers of persons who are unconscious carriers and disseminators of the typhoid bacillus."

WILLIAM C. HANSON, M. D.,
Boston, Mass., Nov. 12, 1908. Acting Secretary.

CORNELL EPIDEMICS FROM MILK AND WATER.

We have no data concerning flies. We do know that our typhoid epidemic five years ago was due to polluted water. It occurred in the winter time, and those drinking water not connected with the infected water supply escaped trouble. This year ten cases of mild typhoid occurred, and on investigation we discovered that all ten received milk from one man. As all came down with the disease about the same time, and as we have about thirty milk dealers, we feel sure that infection in this instance was due to milk.

H. H. CRUM, M. D.,
Ithaca, N. Y., Nov. 5, 1908. Health Officer.

FROM THE "OLD NORTH STATE."

I have made no special observation as to the transmission of typhoid fever by flies, but I believe that the disease is still transmitted to a very considerable extent by infected water and milk. This is especially true where the outbreak is extensive.

RICHARD H. LEWIS, M. D.,
Secretary, State Board of Health.
Raleigh, N. C., Nov. 9, 1908.

The compiler of this pamphlet wishes to acknowledge the assistance given him in his work not only by those whose letters or other writings are quoted, but also by the following:

G. S. Dimmick, Inspector of Milk and Foodstuffs, Galveston, Tex.
Joseph H. Beek, Secretary, St. Paul Jobbers' and Manufacturers' Association, St. Paul, Minn.
Melville F. Rogers, M. D., Secretary, Savin Hill Improvement Association, Dorchester, Mass.
Laura Keisher, M. D., Bureau of Labor, Washington, D. C.
Thomas F. Wiseman, Secretary, Board of Health, Fall River, Mass.
Morris Knowles, Chief Engineer, Bureau of Filtration, Pittsburg, Pa.

THE TRANSMISSION OF DISEASE BY FLIES*

By Daniel D. Jackson, S. B.

Flies, as carriers of disease, have engaged the attention of sanitarians for a decade or more, but it has been only within the last two years that extensive studies have been made to establish the extent to which this method of transmission is carried on.

This recent work has produced a fuller realization of the gravity of the situation, and my remarks on this occasion are intended to give you a résumé of what has been brought out by the work of the Merchants' Association Committee in New York City, and to make a broader use of the principles involved, so as to apply to a greater or less degree to the majority of cities in this country and to any city, town or village in any country where sanitary laws are neglected.

One of the first to suggest that the transmission of typhoid fever was in many cases due to the agency of the house-fly was Dr. George M. Kober, of Washington, D. C. In the report of the Health Officer of the District of Columbia, June 30, 1895, he states that flies may carry to our food supply infectious matter gathered from box privies and from other exposed faecal deposits.

Seven years previous to this Celli had shown that flies fed with pure cultures of typhoid fever bacilli excreted the germs in a virulent condition.

In 1897 Dr. Wallace Clarke, Health Officer of Utica, N. Y., noted that 60 per cent. of the contagious diseases in Utica occurred in the Eighth Ward, a locality not overcrowded and under the same general sanitary regulations as the rest of the city. He found, however, that the garbage dump in this ward had been used also as a dump for human excrement, and that during August (the time of the epidemic of intestinal disease in that city) these dumps were swarming with flies. He at that time attributed the cause of the disease to fly transmission. These dumps have since been removed and proper sanitary methods of sewage and garbage disposal have been adopted, and the death rate of the Eighth Ward of Utica has been thereby reduced to normal.

In September, 1898, Dr. H. A. Veeder published in the New York "Medical Record" a paper entitled, "Flies as Spreaders of Disease in Camps," in which he showed that these insects were the carriers of typhoid fever in the army camps during the Spanish-American War. Similar data were brought out by Dr. George M. Sternberg, Surgeon-General, United States Army, in the Philadelphia "Medical Journal" of June, 1899.

The same year Dr. George H. F. Nuttall wrote an excellent paper on the role of insects in the spread of disease in Volume VIII. of the Johns Hopkins Hospital Reports. The "Report on the Origin and Spread of Typhoid Fever in the United States Military Camps during the Spanish-American War of 1898," by Drs. Reed, Vaughan and Shakespeare, shows that every regiment

*Read before the joint convention of the American Civic Association and the National Municipal League, at Pittsburg, Nov. 19, 1908.

constituting the First, Second, Third, Fourth, Fifth and Seventh Army Corps developed typhoid fever, and that more than 90 per cent. of the volunteer regiments developed it within eight weeks after going into camp. This report also shows that not infected water, but infected flies, were the important factor in the spread of the disease in these camps, and in spite of the fact that more than 80 per cent. of the total deaths were caused by typhoid fever.

Following these revelations, Dr. L. O. Howard, Entomologist of the Department of Agriculture, published several papers on the habits of the house-fly, in one of which (Farmer's Bulletin No. 155, 1902) he showed that the fly was a potent factor in the transmission of typhoid in country districts, due to neglected box privies.

It remained for the Water Pollution Committee of the Merchants' Association of New York to show that the fall rise of typhoid fever, which occurs in most cities, and the enormous summer death rate of children from diarrhœal diseases are also chiefly chargeable to that most detestable of insects, the common house-fly. In 1907 this Committee was appointed by the Merchants' Association to study and to take measures to prevent, as far as possible, the increasing pollution of the inland waters of New York State. Among the first efforts of the Committee was a study of the pollution of New York Harbor and the sanitary condition of the water-front.

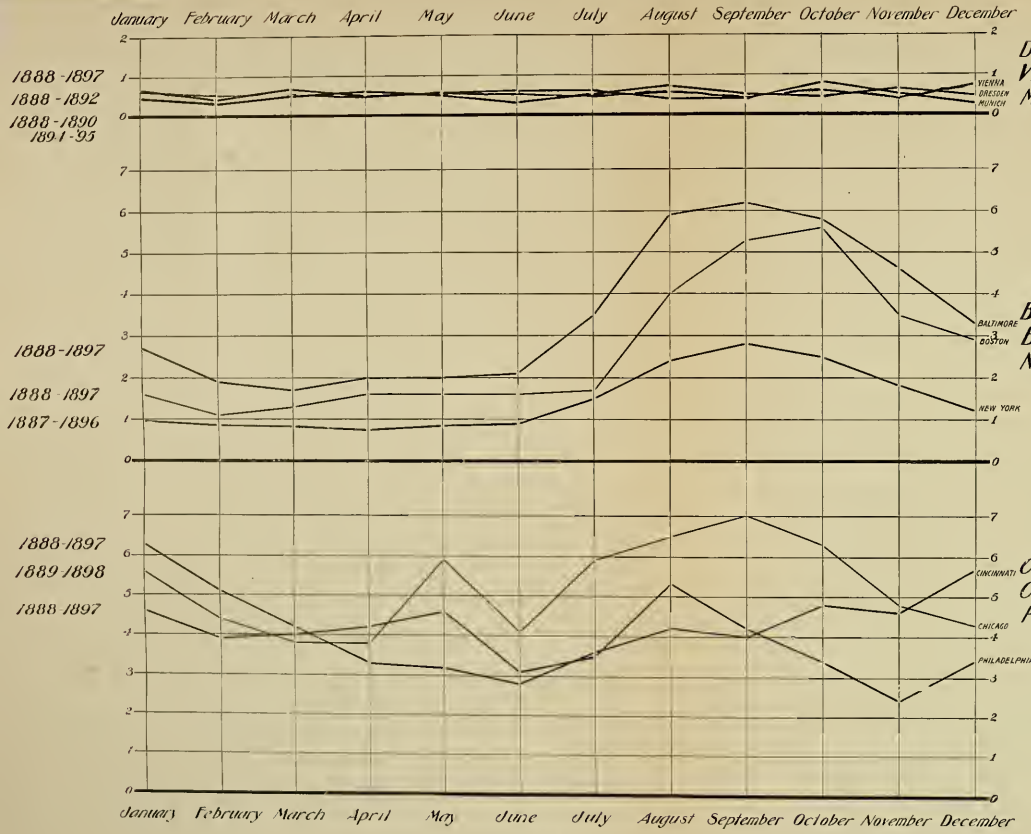
The Committee's report, published in December of the same year, shows by careful sanitary inspections and by statistical and bacteriological data that the activity of the house-fly is the chief cause of intestinal diseases in New York City. Further investigations have shown that in most cities where the water supply is not contaminated, and in fact everywhere throughout the world where water supplies are good, the house-fly is the chief source of typhoid fever and other intestinal diseases by the transmission of the germs of exposed fæcal matter to the food used for human consumption.

I will endeavor to give a brief outline of the studies of our Committee and then to show you that their conclusions have a wider and more important application than was at first deemed possible.

The reports of a corps of inspectors along the water-front of Greater New York all showed the presence of exposed fæcal matter; in some cases solid matter from sewers not removed by the tides and in many instances due to the intolerable toilet conditions on the docks. During the hot weeks in summer these human excreta were found to be swarming with flies. By the use of staining fluids, and by other methods these flies were shown to be traveling back and forth from this filthy material to the food of the nearby restaurants and homes. Microscopic examinations of these flies showed them to be carrying on their mouths and legs considerable quantities of the filthy matter over which they had walked, and this matter, as would be expected, contained many thousands of fæcal bacteria. It was then demonstrated by bacterial methods that this fæcal matter containing disease germs would be strewn about on food wherever the fly walked.

A careful study of the seasonal prevalence of flies by means of daily counts from fly cages in different parts of the city showed that they were active in large numbers only in the comparatively few hot weeks of summer, while the health statistics showed that these were the weeks when an abnormal number of cases of typhoid fever and diarrhœa were contracted. The reported

CHART No. 3



DRESDEN
VIENNA I
MUNICH

Cities having good Water Supplies and Sewage Disposals, and Excellent General Sanitary Conditions, Showing Uniformly Low Typhoid Rate Regardless of Temperature.

BALTIMORE
BOSTON II
NEW YORK

Cities having Fairly good Water Supplies, but at time of Charting, Comparatively Poor Sewage Disposals or Bad General Sanitary Conditions, allowing of the Transmission of Disease by Flies and a Monthly Typhoid Death Rate following the Temperature.

CINCINNATI
CHICAGO III
PHILADELPHIA

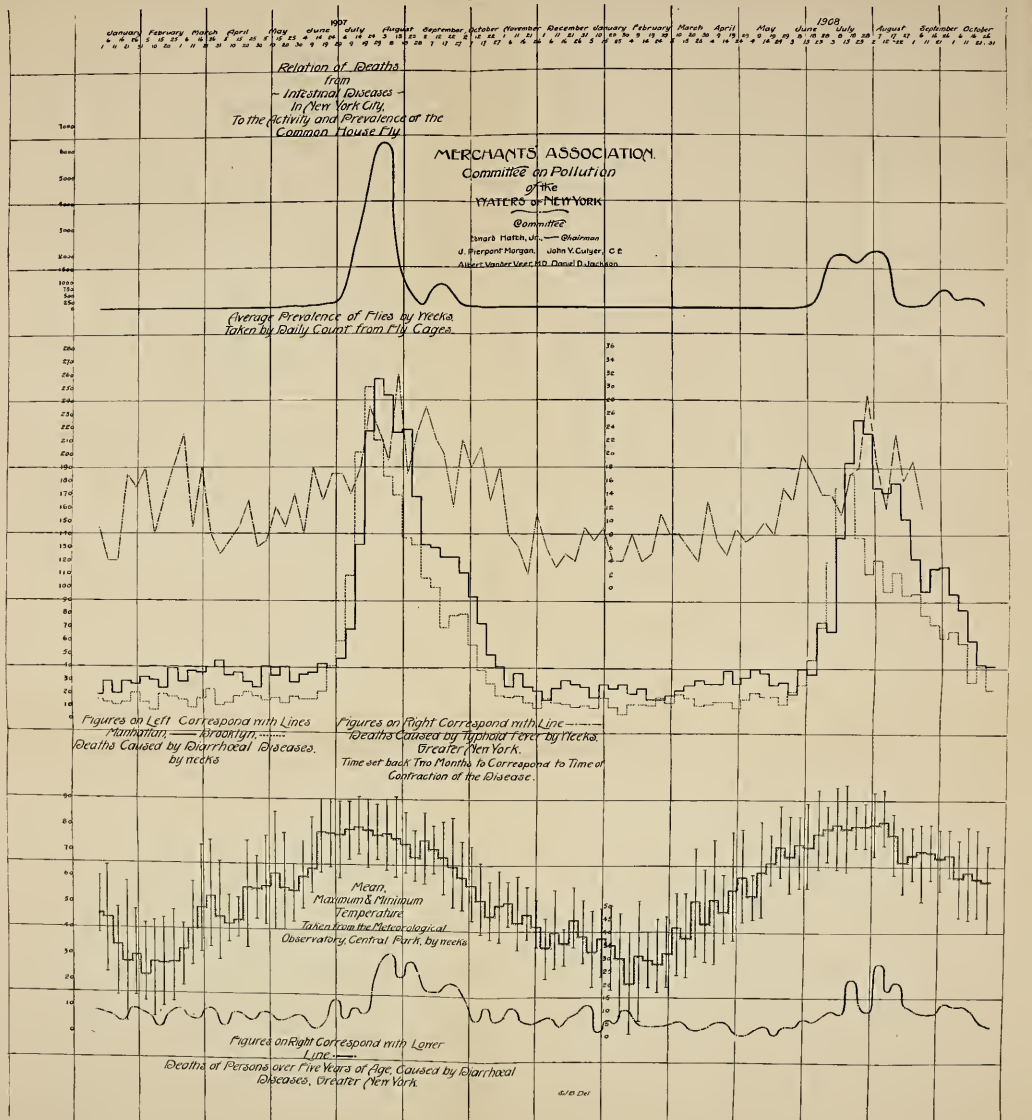
Cities having at the time of Charting Poor Water Supplies and Uniformly High Typhoid Rates Throughout the Year, with little Regard to Temperature.

DIAGRAM SHOWING AVERAGE MONTHLY VARIATIONS IN THE TYPHOID FEVER DEATH RATES OF THREE TYPES OF CITIES.
per 100,000

MERCHANTS ASSOCIATION
COMMITTEE ON POLLUTION OF THE WATERS OF NEW YORK

EDWARD HATCH, JR. CHAIRMAN
J. PIERPONT MORGAN — JOHN Y. GULYER, C.E.
ALBERT VANDER VEER, M.D. — DANIEL D. JACKSON

CHART No. 1


1907
January February March April May June July August September October November December
1908
January February March April May June July August September October
Relation of Deaths from Intestinal Diseases in New York City, To the Activity and Prevalence of the Common House Fly.
MERCHANTS' ASSOCIATION.
Committee on Pollution of the WATERS of NEW YORK
Committee
Edward Hatch, Jr., — Chairman
J. Pierpont Morgan, John V. Cuiyer, C.E.
Albert Vander Veer, M.D. Daniel D. Jackson
Average Prevalence of Flies by Weeks. Taken by Daily Count from Fly Cages.
Figures on Left Correspond with Lines Manhattan ——— Brooklyn ------
Deaths Caused by Diarrhoeal Diseases. by weeks
Figures on Right Correspond with Line -·-·-·-
Deaths Caused by Typhoid Fever by Weeks. Greater New York.
Time set back Two Months to Correspond to Time of Contraction of the Disease.
Mean, Maximum & Minimum Temperature
Taken from the Meteorological Observatory, Central Park, by weeks
Figures on Right Correspond with Lower Line ——
Deaths of Persons over Five Years of Age, Caused by Diarrhoeal Diseases, Greater New York.
E/B Del

number of cases of these diseases rose with the rise in the prevalence of flies and fell with but slight lag with the decrease in the numbers of flies trapped.

Finally maps were made showing by black dots the location of every fatal case of intestinal disease during the fly season. A black belt was found to run along the water-front. Most of the deaths were within three blocks of the shore line. Wherever there was any material exception to the rule investigation showed the presence of exposed out-houses and fæcal matter swarming with flies; in other words, conditions as bad as along the water-front. Here also, then, had filth and flies combined in the destruction of human life.

Do not think for a moment that because you do not live in New York these matters do not directly affect each and every one of you here. The statistics in practically all American cities—and in many foreign cities, too, for that matter—show a marked rise in the number of deaths from typhoid fever and intestinal diseases during the fly season.

In cities where flies are the chief cause of intestinal epidemics the other seasons of the year show comparative freedom from the disease, while in cities where water and milk epidemics exist these epidemics may occur at any season of the year. The milk epidemic, however, often takes place during the fly season because of the infection of milk by flies at the farm or in the local milk depots.

The danger to health is greatest in parts of the city where sanitary precautions are most neglected, but even if you live in a comparatively well-cared-for part of town do not receive the fly into your home as a harmless visitor, for he may come in a carriage or on horseback from the filthiest spot in the city.

Hitherto the fly has been regarded complacently as a harmless nuisance and considered to be an annoying creature with great persistence and excessive familiarity. Regarded in the light of recent knowledge the fly is more dangerous than the tiger or the cobra. Worse than that, he is, at least in our climate, much more to be feared than the mosquito and may easily be classed, the world over, as the most dangerous animal on earth.

It has been for some time thoroughly well demonstrated that he is one of the chief agencies in the spread of Asiatic cholera. We now know him to be the source of a high percentage of the cases of typhoid fever and the chief disseminator of diarrhœal diseases, from which about 7,000 children die annually in New York City alone.

On Charts No. 1 and 2, which are presented, can be seen the seasonal rise and fall of reported deaths from typhoid fever and other diarrhœal diseases. It will be noted that year after year they correspond to the rise and fall of the prevalence of house-flies.

On Chart No. 2 is shown a comparison of the weekly death rates per 100,000 from diarrhœal diseases of children for six typical American cities. The cities represented by full lines had at the time of charting good water supplies, comparatively free from contamination, while those given by the broken lines had poor or questionable water supplies.

It will be noted that in the cities of the first type the deaths of children from intestinal disease is higher throughout the year, but that in all of the cities

a sudden and very marked rise takes place during the fly season. It will also be noted that in the cities further south the rise comes earlier in the year.

On Chart No. 3 are given the seasonal rise and fall of three different classes of cities:

I. Cities having good water supplies, proper sewage disposal systems and excellent general sanitary conditions, showing an uniformly low typhoid rate throughout the year, regardless of temperature.

II. Cities having fairly good water supplies, but at the time of charting comparatively poor sewage disposal systems or bad general sanitary conditions, allowing the transmission of disease by flies. These diagrams show monthly typhoid death rates, which, if set back two months to correspond with the contraction of the disease, follow the temperature and the activity of the insects.

III. Cities having at the time of charting poor water supplies and uniformly high typhoid rates throughout the year with little relationship to temperature.

In the accompanying table will be found the actual figures by weeks during 1907 and 1908 of the deaths from diarrhœal diseases in New York City, and the number of flies caught in traps at a representative station in the city during the fly season. If during this season we subtract fifty deaths a week as being the normal weekly death rate from diarrhœal diseases, excluding typhoid fever, we shall have 4,496 deaths due to flies during 1907 and 4,012 deaths due to flies during 1908.

By the same process, if we subtract six deaths a week as being the normal death rate from typhoid fever in New York City, due to imported cases and direct transmission from these cases, we have about 330 deaths from typhoid fever during the fly season in 1907 traceable to flies, as against an estimate of 260 deaths from the same causes in 1908.

In other words, there has been in New York City this year a reduction during the fly season of about seventy deaths from typhoid fever and 484 deaths from diarrhœa. Most of the unsanitary conditions pointed out in last year's report have not yet been remedied. These evils exist in most of our cities as well as in our country districts, and we as Americans should agitate this matter of sewage disposal and general sanitation, not only for humane purposes, but for patriotic reasons as well, so that we may not feel ashamed to compare our death rates from filth diseases with those of European cities.

Table Showing Total Deaths by Weeks from Diarrhoeal Diseases Compared with the General Prevalence of Flies in Brooklyn Station, No. 1
Flies Caught in Cages During the Week.

~ 1907 ~ Week Ending	Deaths from Diarrhoeal Diseases.	Flies Caught in Cages during Week	~ 1908 ~ Week Ending	Deaths from Diarrhoeal Diseases	Flies Caught in Cages during Week
June 1	55	2	May 30	51	12
" 8	58	8	June 6	50	55
" 15	55	34	" 13	78	250
" 22	70	75	" 20	92	500
" 29	86	244	" 27	164	1,500
July 6	124	921	July 4	212	2,000
" 13	219	2,696	" 11	368	2,000
" 20	386	4,165	" 18	448	1,740
" 27	566	5,727	" 25	437	1,920
August 3	576	6,224	August 1	398	2,180
" 10	517	3,926	" 8	355	2,104
" 17	478	1,165	" 15	331	1,190
" 24	422	435	" 22	349	127
" 31	346	99	" 29	290	98
September 7	277	584	September 5	254	104
" 14	262	884	" 12	218	111
" 21	247	592	" 19	217	450
" 28	232	182	" 26	206	641
October 5	213	52	October 3	184	312
" 12	168	47	" 10	176	363
" 19	128	51	" 17	118	310
" 26	91	32	" 24	104	104
November 2	70	22	" 31	74	96

DAMAGES FOR SICKNESS CAUSED BY FLIES

The courts have passed upon the question of damages for a sufferer from typhoid who could trace his illness to flies feeding upon the filth of sewage. A few years ago a man living in Germantown, Philadelphia, recovered heavy damages from the city for his illness, which he proved was caused by a stream flowing through his yard which had been polluted by sewage from a house tenanted by a typhoid patient. The defence relied upon proof that the plaintiff had neither drunk from nor bathed in the stream, but an entomologist convinced the jury that he had contracted the disease through the medium of flies which had carried the infection from the stream to the food exposed to their visits in his house.

HOW THE "TYPHOID FLY" IS FOUGHT IN WASHINGTON

Dr. L. O. Howard, *Chief of the Bureau of Entomology, U. S. Department of Agriculture, in Bulletin No. 78*

The name "typhoid fly" is here proposed as a substitute for the name "house-fly," now in general use. People have altogether too long considered the house-fly as a harmless creature, or, at the most, simply a nuisance. While scientific researches have shown that it is a most dangerous creature from the standpoint of disease, and while popular opinion is rapidly being educated to the same point, the retention of the name house-fly is considered inadvisable, as perpetuating in some degree the old ideas. Strictly speaking, the term "typhoid fly" is open to some objection, as conveying the erroneous idea that this fly is solely responsible for the spread of typhoid; but considering that the creature is dangerous from every point of view, and that it is an important element in the spread of typhoid, it seems advisable to give it a name which is almost wholly justified and which conveys in itself the idea of serious disease. Another repulsive name that might be given to it is "manure fly," but recent researches have shown that it is not confined to manure as a breeding place, although perhaps the great majority of these flies are born in horse manure. For the end in view, "typhoid fly" is considered the best name.

In 1899 the writer began the study of the typhoid or house-fly under both country and city conditions. He made a rather thorough investigation of the insect fauna of human excrement, and made a further investigation of the species of insects that are attracted to food supplies in houses. In a paper entitled "A Contribution to the Study of the Insect Fauna of Human Excrement (with special reference to the spread of typhoid fever by flies)," published in the Proceedings of the Washington Academy of Sciences, Volume II, pages 541-604, December 28, 1900, he showed that 98.8 per cent of the whole number of insects captured in houses throughout the whole country under the conditions indicated above were *Musca domestica,* the typhoid or house-fly. He showed further that this fly, while breeding most numerously in horse stables, is also attracted to human excrement and will breed in this substance. It was shown that in towns where the box privy was still in existence the house fly is attracted to the excrement, and, further, that it is so attracted in the filthy regions of a city where sanitary supervision is lax and where in low alleys and corners and in vacant lots excrement is deposited by dirty people. He stated that he had seen excrement which had been deposited overnight in an alleyway in South Washington swarming with flies under the bright sunlight of a June morning (temperature 92° F.), and that within 30 feet of these deposits were the open windows and doors of the kitchens of two houses kept by poor people, these two houses being only elements in a long row. The following paragraph is quoted from the paper just cited:

"Now, when we consider the prevalence of typhoid fever and that virulent typhoid bacilli may occur in the excrement of an individual for some time before the disease is recognized in him, and that the same virulent germs may be found in the excrement for a long time after the apparent recovery of a patient, the wonder is not that typhoid is so prevalent but that it does not prevail to a much greater extent. *Box privies should be abolished in every community.* The depositing of excrement in the open within town or city limits should be considered a punishable misdemeanor in communities which have not already such regulations, and it should be enforced more rigorously in towns in which it is already a rule. Such offenses are generally committed after dark, and it is often difficult or even impossible to trace the offender; therefore, the regulation should be carried even further and require the first responsible person who notices the deposit to immediately inform the police, so that it may be removed or covered up. Dead animals are so reported; but human excrement is much more dangerous. Boards of health in all communities should look after the proper treatment or disposal of horse manure, primarily in order to reduce the number of house-flies to a minimum, and all regulations regarding the disposal of garbage and foul matter should be made more stringent and should be more stringently enforced."

Even if the typhoid or house-fly were a creature difficult to destroy, the general failure on the part of communities to make any efforts whatever to reduce its numbers could properly be termed criminal neglect; but since, as will be shown, it is comparatively an easy matter to do away with the plague of flies, this neglect becomes an evidence of ignorance or of a carelessness in regard to disease-producing filth which to the informed mind constitutes a serious blot on civilized methods of life.

The orders of the health department of the District of Columbia, published May 3, 1906, if carried out will be very effective. These orders may be briefly condensed as follows:

All stalls in which animals are kept shall have the surface of the ground covered with a water-tight floor. Every person occupying a building where domestic animals are kept shall maintain, in connection therewith, a bin or pit for the reception of manure, and pending the removal from the premises of the manure from the animal or animals shall place such manure in said bin or pit. This bin shall be so constructed as to exclude rain water, and shall in all other respects be water-tight, except as it may be connected with the public sewer. It shall be provided with a suitable cover and constructed so as to prevent the ingress and egress of flies. No person owning a stable shall keep any manure or permit any manure to be kept in or upon any portion of the premises other than the bin or pit described, nor shall he allow any such bin or pit to be overfilled or needlessly uncovered. Horse manure may be kept tightly rammed into well-covered barrels for the purpose of removal in such barrels. Every person keeping manure in any of the more densely populated parts of the District shall cause all such manure to be removed from the premises at least twice every week between June 1 and October 31, and at least once every week between November 1 and May 31, of the following year. No person shall remove or transport any manure over any public highway in any of the more densely populated parts of the District except in a tight vehicle, which, if not inclosed, must be effectually covered with canvas, so as to prevent the manure

from being dropped. No person shall deposit manure removed from the bins or pits within any of the more densely populated parts of the District without a permit from the health officer. Any person violating any of these provisions shall, upon conviction thereof, be punished by a fine of not more than $40 for each offense.

In addition to this excellent ordinance, others have been issued from the health department of the District of Columbia which provide against the contamination of exposed food by flies and by dust. The ordinances are excellently worded so as to cover all possible cases. They provide for the registration of all stores, markets, cafés, lunch rooms, or of any other place where food or beverage is manufactured or prepared for sale, stored for sale, offered for sale, or sold, in order to facilitate inspection, and still more recent ordinances provide for the registration of stables. An excellent campaign was begun during the summer of 1908 against insanitary lunch rooms and restaurants. A number of cases were prosecuted, but conviction was found to be difficult.

For one reason or another, the chief reason being the lack of a sufficient force of inspectors under the control of the health officers, the ordinance in regard to stables has not been carried out with that perfection which the situation demands. In the summer of 1896, the health officer of the District, Dr. W. C. Woodward, designated a region in Washington bounded by Pennsylvania avenue, Sixth street, Fifteenth street, and the Potomac River, which was to be watched by assistants of the writer. Twenty-four stables were located in this region and were visited weekly by two assistants chosen for the purpose. The result was that on the whole the manure was well looked after and the number of flies in the region in question was very considerably reduced during the time of inspection.

Were simple inspection of stables all that is needed, a force of four inspectors, specially detailed for this work, could cover the District of Columbia, examining every stable, after they were once located and mapped, once a week. The average salary of an inspector is $1,147, so that the total expense for the first year would be something like $4,500. But the inspectors' service is complicated by the matter of prosecution. Much of the time of inspectors would be taken in the prosecution of the owners of neglected premises. Moreover, the health officer has found during the summer of 1908, in his prosecution of the owners or managers of insanitary restaurants, that his inspectors were practically sworn out of court by the multiplicity of opposing evidence. This means that it will be necessary in such cases to send two inspectors together in all cases, so that the testimony of one may be supported by the testimony of the other. This, perhaps, would double the number of necessary inspectors, making the expense of the service something over $9,000. It is reasonably safe to state, however, that with such an expense for competent service, or perhaps with a slightly added expense, the typhoid fly could be largely eliminated as an element in the transfer of disease in the District of Columbia, and the difficulty which the authorities have had in locating the cause of a very considerable proportion of the cases of typhoid in the District for the past two or three years indicates plainly to the mind of the writer that the typhoid fly is a much more important element than has been supposed. It is a comforting although comparatively insignificant fact and a matter of common observation that in certain sections of the city the typhoid fly has been much less numerous during the past summer than in previous years. The writer is inclined to attribute this to the gradual disappearance of horse stables in such sections, brought about by the rapidly increasing use of motor vehicles.

THE GUILT OF THE "TYPHOID FLY" SCIENTIFICALLY ESTABLISHED

From the Report of Dr. Alice Hamilton *on the Typhoid Fever Epidemic in Chicago in July-September, 1902*

Two places were selected in the neighborhood of Hull House as especially favorable for such an examination.* The first was an unconnected privy on Polk street, into which the discharges from two cases of typhoid fever were being thrown without any attempt at disinfection. The vault was either very shallow or very full, for the dejecta lay within three feet of the opening and had caught on the projecting scantling within a foot of the opening. The flies caught within the vault, on the fence of the yard, and inside the sick-room of one of the patients, which was also used as a kitchen, were dropped into test-tubes containing culture medium and allowed to remain there for periods varying from fifteen minutes to twelve hours, and were taken to the laboratory of the Memorial Institute for Infectious Diseases for examination. The full details of this part of the investigation have been published in the "Journal of the American Medical Association." In two of the tubes, the one from the sick-room and the one from the yard, the typhoid bacillus was discovered. In one of the tubes inoculated by flies from the vault a bacillus was discovered closely related to but not identical with the typhoid bacillus, belonging apparently to the group intermediate between the typhoid and colon groups. This is a group of bacilli which have been isolated from patients suffering from typhoid-like affections.

The second place chosen was a yard on Aberdeen street containing one large, full and filthy vault, not connected with the sewer. This is used by sixteen families. Flies from the three privies built over this cesspool were used to inoculate four tubes. Other flies from the fence of the yard and from the walls of the two houses bounding the yard at varying distances from the vault were dropped into six tubes. In three of these tubes the typhoid bacillus was discovered.

At the time the collection was made there were no fresh typhoid discharges being emptied into this vault, so that the presence of living typhoid bacilli on the legs of the flies apparently proves either that the bacilli already in the vault were living and multiplying, or that the discharges of the recovered cases still contained typhoid bacilli. In the Polk street house the flies caught in the sick-room are especially interesting. This room was also used as a kitchen, and at the time the collection was made the table was covered with food upon which could be seen flies both living and dead. The conditions found at these two places are repeated over and over in this neighborhood; and when one considers that, in addition to the privies and defective plumbing, there are the sewer-infected back yards, that food is kept more or less exposed, not only in the houses, but in the groceries and fruit-stands, and that the houses are not furnished with screens, it can easily be seen what an important part the house-fly may play in the spread of typhoid infection in such a neighborhood. It can also be seen that this is one factor which does not come into play to such an extent in more well-to-do parts of the city, where the screens and good plumbing

* To show the agency of flies in the dissemination of typhoid infection

are the rule, or in newer parts of the city, where the excrement is properly disposed of. It seems, therefore, not unwarranted to assume that the contraction of typhoid fever in this particular quarter of the city during the late epidemic was due to the spread of the bacilli by flies from the undrained or imperfectly drained cesspools, the leaking closets, and the infected earth of the yards.

When such conditions as these exist in any part of a city, they form a lasting menace to the health of the community. The danger is not over with the ending of warm weather and the subsidence of the epidemic. Experiments have shown that the urine and fæces of recovered typhoid patients contain living bacilli for many weeks after every trace of the illness is over. The winter does not kill the bacilli: they have been found living in sewage-polluted soil 315 days after they were planted there, although in ordinary non-polluted soil they soon disappear.

HOW TO CHECK THE BREEDING OF FLIES

From a Paper by ROBERT NEWSTEAD, A. L. S., F. E. S., *in the "Annals of Tropical Medicine and Parasitology" of the Liverpool School of Tropical Medicine—Vol.* 1, *November* 4, 1908

If house-flies are to be reduced to a minimum, I would submit the following suggestions:

1. That stable manure and spent hops should not be allowed to accumulate in the middensteads* during the months of May to October, inclusive, for *a period of more than seven days.*

2. All middensteads should be thoroughly emptied and carefully swept at the period stated in 1.

The present system of *partly emptying* such receptacles should in all cases be discontinued.

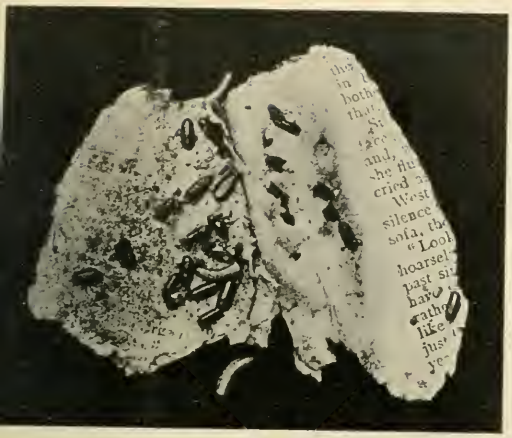
The walls of middensteads should also be cemented over, or, failing this, the brickwork should be sound and well pointed.

3. That all ashpits should be emptied, during the summer months, at intervals of not more than ten days.

4. That the most strenuous efforts should be made to prevent children defecating in the courts and passages; or that the parents should be compelled to remove such matter immediately; and defecation in stables middens should be strictly forbidden. The danger lies in the overwhelming attraction which such fæcal matter has for house-flies, which later may afterwards come into direct contact with man or his foodstuffs. They may, as Veeder puts it, "in a very few minutes * * * load themselves with dejections from a typhoid or dysenteric patient, not as yet sick enough to be in hospital or under observation, and carry the poison so taken up into the very midst of the food and water ready for use at the next meal. There is no long roundabout process involved."

5. Ashpit refuse, which in any way tends to fermentation, such as bedding, straw, old rags, paper, waste vegetables, dirty bedding from the hutches of pet animals, etc., should, if possible, be disposed of by the tenants, preferably by incineration, or to be placed in a separate receptacle so that no fermentation

*Manure pits or similar receptacles.



FLY LARVÆ AND PUPÆ IN WASTE PAPER (ASH-PIT REFUSE)
NATURAL SIZE

EGGS OF HOUSE-FLY GREATLY ENLARGED, SHOWING THE SEGMENTS OF THE LARVÆ THROUGH THE CUTICLE

Photographs by Robert Newstead; by courtesy of the Liverpool School of Tropical Medicine.

BACTERIA LEFT BY FLY PASSING OVER GELATINE PLATE
(Permission of Doubleday, Page & Co.)

could take place. If such precautions were adopted by householders, relatively few house-flies would breed in the ashpits, and the present system of emptying such places at longer intervals than, say, four to six weeks, might be continued.

6. The application of Paris green at the rate of 2 ounces to one gallon of water to either stable manure or ashpit refuse will destroy 99 per cent of the larvæ. Possibly a smaller percentage of Paris green might be employed with equally good results.

One per cent of crude atoxyl in water kills 100 per cent of fly larvæ.

The application of either of these substances might, however, lead to serious complications, and it is very doubtful whether they could be employed with safety. Paris green, at the rate of 1 to 2 ounces to 20 gallons of water, is used largely as an insecticide for fruit pests. It does no harm to vegetation when applied in small quantities; but cattle might be tempted to eat the dirty straw in manure which had been treated with the substance, and the results might prove fatal if large quantities were eaten.

7. The use of sun-blinds in all shops containing food which attracts flies would, in my opinion, largely reduce the number of flies in such places during hot weather. Small fruiterers' and confectioners' shops, as a rule, are not shaded by sun-blinds, and in their absence flies literally swarm on the articles exposed for sale.

8. The screening of middensteads with fine wire gauze would, undoubtedly, prevent flies from gaining access to manure, etc., but it is very doubtful if this method would meet with any marked success. The gauze would rapidly oxidize, the framework supporting it would probably warp, and numbers of flies would be admitted whenever the receptacle was opened. Moreover, the erection of such a structure would prove a great inconvenience and a hindrance to the removal of the refuse. This, however, does not prejudice the possibility of erecting a good fly-proof screen in the future.

FLIES, CONSUMPTION AND TYPHOID

From a Paper by John B. Huber, M. D., *Professor of Pulmonary Diseases, Fordham University Medical School, New York, in the "New York State Journal of Medicine"*

The tubercle bacillus is unquestionably distributed by flies. No one can doubt this who has seen the photograph which depicts a Petrie plate containing a nutrient medium upon which was deposited a fly that had previously walked in and had got the sputum of a consumptive entangled in its feet. A glass cover confined the fly. The plate was at first perfectly clear; soon colonies, visible to the naked eye and made up of uncountable bacilli, developed upon the track made by this fly.

It is certain that flies help greatly to swell the infant death rate. The infant mortality is greatest in fly time. There are few more congenial culture media for bacteria than milk, especially amidst the uncleanliness which obtains in the houses of many very poor people. This fluid easily becomes contaminated with the excreta of flies and with the noxious matter clinging to their feet. Tuberculosis is thus in a very appreciable manner contracted by children, as

also dysenteries and diarrhœas. This is especially so since we are now convinced that all kinds of diarrhœas, except the comparatively few cases which are induced by mechanical causes, are due to specific germs. The work, which has been accomplished by the authorities, with the co-operation of medical and other beneficent societies, has had the result that contamination of milk by flies, before it reaches the consumer, is probably rare nowadays; the infection which results from milk through the agency of flies becomes possible mostly after delivery to the consumer.

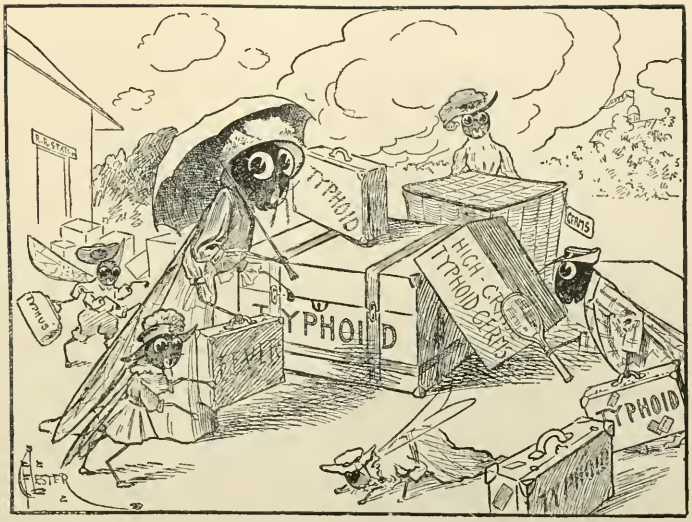
Typhoid fever is certainly disseminated by flies, although there are, of course, other sources of infection. Flies pollute food and drink by means of the excreta which they convey from dung-heaps, manure-pits, open closets, and of the refuse which they convey from rotting vegetable matter. They breed almost exclusively in excrement. They certainly disseminate cholera; and cases of tetanus seem to have been originated through their agency.

THE HOUSE-FLY AND ITS CONNECTION WITH DISEASE DISSEMINATION

From a Paper in the New York "Medical Record," January 26, 1907, by Gordon K. Dickinson, M. D., *Surgeon, City Hospital, Jersey City, N. J.*

Seven different varieties of flies are found in our houses, 98 per cent of which is the common house-fly *(Musca domestica)*. Born in manure, generally that of the horse, or in decomposing matter of any kind, vegetable as well as animal, they enter our homes to alight on foods there stored. Their tastes are indelicate and omnivorous; they subsist on sputum, fæcal juices, and the slime and dirt that stick to exposed surfaces. Their proboscides, through which they feed, are connected with an extremely active salivary gland, capable of pouring out a large quantity of saliva, which the fly projects against a dry surface, swallowing the subsequent solution. Naturally, solid particles, living organisms, parasites, and eggs, small enough, may pass into this digestive tube. Bacilli of different types and eggs of the nematodes have been observed in the proboscides, stomach, intestinal tract and defecations. The time that particles remain in the digestive tract of the fly is from 12 to 23 days. Evidently the digestive secretions are not active for harm, as organisms will not only pass through alive, but increase in number while in transit. There must be some absorption of the toxins of bacilli, for flies die in large numbers which have had the fortune to imbibe such bacilli as those of the plague and anthrax. Flies are large breeders, lay their eggs by preference in horse manure, but also in decaying meat, meat broth, cut melons, dead animals, and even in cuspidors. On these substances their larvæ subsist until they hatch. From 10 days to two weeks after the time the eggs have been laid the fly is fully hatched. It is estimated that one fly, laying 120 eggs at a time, will have a progeny amounting up to the sextillions at the end of the season.

Every privy, every open window, every dead animal in the street, expectorations of people suffering or incompletely recovered from any infectious disease, the nares of scarletina patients suffering from catarrh or acquired colds—in fact, all conditions where pathogenic bacteria or intestinal parasites



OUR FIRST SUMMER BOARDER. THE ARRIVAL OF MADAM FLY, HER CHILDREN AND HER BAGGAGE.

By courtesy of *Good Housekeeping*

CONSUMPTIVE SPITTING ON FLOOR. FLIES FEEDING ON IT, CARRY THE GERMS OF THE DISEASE TO FOOD.

THE SPIT DRIES AND CARELESS SWEEPING, DUSTING OR DRAUGHTS CAUSE THE GERMS TO FLOAT IN THE AIR.

THE GERMS MAY ENTER THE BODIES OF CHILDREN PLAYING ON THE FLOOR, THROUGH SORES OR WOUNDS.

OTHERS MAY GET THE DISEASE BY BREATHING OR SWALLOWING THE GERMS.

SPRAY GIVEN OFF IN SNEEZING OR COUGHING, CONTAINS GERMS IN A MOIST AND ACTIVE STATE.

NEW YORK STATE DEPARTMENT OF HEALTH.

ONE OF THE POPULAR EDUCATIONAL BANNERS USED BY THE NEW YORK STATE DEPARTMENT OF HEALTH TO SHOW HOW HOUSE-FLIES CARRY THE GERMS OF TUBERCULOSIS

may openly exist, make possible, and even probable, the spread of disease by flies. This, being known, should be acted upon. There are few boards of health as intelligent and far-sighted as that of Philadelphia, which has taken vigorous measures to protect the public against infection of food by flies. Inspectors are directed to visit all milk houses, butcher shops, grocery and candy stores, and instruct the owners to place a covering over all articles. The order reads: "The chiefs of divisions of nuisances, milk and meat, and cattle inspectors are hereby instructed to visit all retail dealers exposing for sale in front of their properties meats, fish, vegetables, fruits, candies, and cake, and instruct the proprietors that a covering of some suitable material must be provided to protect the goods so exposed from flies and insects generally."

When mosquitoes were discovered to have a part in the dissemination of malaria and yellow fever, it was thought that a prevention of their breeding was too great a proposition, yet it has been satisfactorily accomplished, so that now one case of yellow fever in all Cuba will create more comment in the daily papers than at one time an epidemic in Havana. Certainly, when the profession and the laity become alive to the dangers incident to the presence of flies, and recognize in them a receptacle and a carrier, then will the problem be attacked and solved.

Attached to all stables there should be built a pit of sufficient size, closed tightly, with the exception of a ventilating window properly screened, and so constructed that little direct light may enter. Manure, as soon as dropped from the animal, should be pushed into this pit, and chloride of lime or crude oil frequently scattered over its contents. All organic filth, such as human manure, if conditions do not allow of a sewerage system, should be covered immediately with sufficient earth. All offal and organic débris, in which flies can lay their eggs and propagate, should be disposed of, secluded, or screened. Hospitals, particularly where contagious diseases exist, and rooms containing the same, should have all the windows and doors carefully screened, and every effort made to rid the interior of such flies as may enter. All food, particularly milk and such articles as are eaten uncooked, should receive full attention and protection.

PROTECTION OF FOOD SUPPLIES FROM FLIES

From a Paper in "Country Life in America," June, 1903, *by* WILLIAM LYMAN UNDERWOOD, *Lecturer in the Massachusetts Institute of Technology*

It is most important that flies should be kept away from all food supplies.

To this end every effort should be made, first, to do away with all places that are favorable for the breeding of flies. Horse manure should be kept in a closed pit, or the place where it is stored should be screened. Metal screens that will not rust are best for this purpose, but, unfortunately, they are too high-priced to permit of their being used by the majority of people who live in the country. Cotton mosquito netting, however, is not very expensive, and, though it will not last as long as the rust-proof metal screens, it is just as effective in keeping out the flies. Cotton netting can generally be purchased at a trifle over three cents a square yard when bought by the piece, and each piece contains sixteen square yards. Where it is not practical to use screens, chlo-

ride of lime, if used in liberal quantities and well sprinkled through the manure, will prevent the development of any eggs which may be deposited in the manure.

In the second place, screens or cotton netting should be put upon the kitchen and dining-room doors and windows, and a sheet or two of sticky fly-paper, which can be bought at nearly every country store, should be placed in all rooms where food is prepared, exposed, or eaten. Fly-traps, of which there are several varieties upon the market, are also of great use in destroying those flies which sometimes, in spite of nettings, find their way into rooms where the screen doors are frequently opened.

Finally, the privy should be thoroughly screened, or, better yet, where possible it should be done away with altogether. In no way can the wastes from the human body be more safely and easily disposed of than through the medium of water. Earth closets, where it is not practicable to introduce water for this purpose, are coming very generally into use, and it is to be hoped that before many years the old-fashioned country outhouse, with its exposure to flies and its many other objectionable features, will be a thing of the past.

ON ONE FLY, 6,600,000 BACTERIA

The following tabulation, with the accompanying comments, is taken from Bulletin No. 51 (April 1908), of the Agricultural Experiment Station at Storrs, Conn. The investigations were made by W. M. Esten and C. J. Mason:

SOURCES OF BACTERIA FROM FLIES.

	Source	Total Number	Total Acid Bacteria	Rapid Liquefying Bacteria	Slow Liquefying Bacteria	Bacterium lactis acidi Group A Class 1	Coli-aerogenes Group A Class 2
1907 July 27	[a] 1 fly. Bacteriological Laboratory.	3,150	250	600	100	.....	.....
July 27	[b] 1 fly. Bacteriological Laboratory.	550	100	0	0	.....	.....
Aug. 6	[c] 19 Cow Stable Flies.	7,980,000	220,000	0	20,000	.....	.....
	Average per fly.	420,000	11,600	0	1,000	.....	.....
Aug. 14	[d] 94 Swill Barrel Flies.	155,000,000	8,950,000	0	0	4,320,000	4,630,000
	Average per fly.	1,660.000	95,300	0	0	46,000	49,300
Aug. 14	[e] 144 Pig Pen Flies.	133,000,000	2,110,000	100.000	206,000	933,000	1.176,000
	Average per fly.	923.000	18,700	700	1,150	6,500	12,200
Sept. 4	[f] 18 Swill Barrel Flies.	118,800,000	40,480,000	0	14,500,000	10,480,000	30,000,000
	Average per fly.	6,600,000	2,182,000	0	804,000	582,000	1 600,000
Sept. 21	[g] 30 Dwelling House Flies.	1.425,000	125,000	0	12,500	.....	.....
	Average per fly.	47,580	4,167	0	417	.....	.....
Sept. 21	[h] 26 Dwelling House Flies.	22,880,000	22,596,000	120.000	34,000	.....	.....
	Average per fly.	880,000	869,000	4.600	1.300	.....	.....
Sept. 27	[i] 110 Dwelling House Flies.	35,500.000	13,670,000	8,840,000	125,000	.....	.....
	Average per fly.	322,700	124 200	80,300	1,100	.....	.....
Aug. 20	[j] 1 Large Blue Bottle Blow Fly	308,700	2.200 mo	uld spores		.....	.....
	Total average of 414 Flies.	1,222,570	367.300	7,830	73,500	.....	.....
	Average % of 414 Flies.		30%	6%	6%	.....	.....
	Average per fly of 256 flies, experiments [d], [e] and [f]	3,061,000	765,000	230	268,700	211,500	553,800
	Average per cent of 256 flies experiments [d], [e] and [f].		25%		8%	7%	18%

From the above table the bacterial population of 414 flies is pretty well represented. The domestic fly is passing from a disgusting nuisance and troublesome pest to a reputation of being a dangerous enemy to human health. A

species of mosquito has been demonstrated to be the cause of the spread of malaria. Another kind of mosquito is the cause of yellow fever, and now the house-fly is considered an agency in the distribution of typhoid fever, summer complaint, cholera infantum, etc.

The numbers of bacteria on a single fly may range all the way from 550 to 6,600,000. Early in the fly season the numbers of bacteria on flies are comparatively small, while later the numbers are comparatively very large. The place where flies live also determines largely the numbers that they carry. The average for the 414 flies was about one and one-fourth millions bacteria on each. It hardly seems possible for so small a bit of life to carry so large a number of organisms. The method of the experiment was to catch the flies from several sources by means of a sterile fly net, introduce them into a sterile bottle and into the bottle a known quantity of sterilized water, then shake the bottle to wash the bacteria from the bodies, to simulate the number of organisms that would come from a fly in falling into a lot of milk. In experiments "D," "E," and "F" the bacteria were analyzed into four groups. The objectionable class, coli-ærogenes type, was two and one-half times as abundant as the favorable acid type. If these flies stayed in the pig-pen vicinity there would be less objection to the flies and the kinds of organisms they carry, but the fly is a migratory insect and it visits everything "under the sun." It is almost impossible to keep it out of our kitchens, dining-rooms, cow stables and milk-rooms. The only remedy for this rather serious condition of things is, remove the pig-pen as far as possible from the dairy and dwelling house. Extreme care should be taken in keeping flies out of the cow stable, milk-rooms, and dwellings. Flies walk over our food and are the cause of one of the worst contaminations that could occur from the standpoint of cleanliness and the danger of distributing disease germs.

HOW FLIES CARRY TYPHOID GERMS

From a Paper by Mark A. Brown, M. D., *Health Officer of Cincinnati, O.*

Unless the most stringent measures are immediately taken for the proper disinfection of these [typhoid] discharges they become almost at once the haven for innumerable flies, the bodies of which harbor innumerable typhoid germs. The alternate visitations of the common house-fly from the latrine, trench or privy, his natural habitation, to the kitchen and dining-room, afford most ample opportunity for the infection of our food and drink, particularly of milk. This illustration is by no means fanciful or far-fetched. The commission appointed by the Government to investigate the typhoid epidemic which occurred among our soldiers during the Spanish-American War, of which commission Vaughan, of Ann Arbor, was chairman, reported that infection of food supplies by means of flies was probably of even more importance than the infection of drinking water. It is a noticeable fact that while officers and men drank the same water, typhoid fever was comparatively much less among the former, as all unknowingly the food supplies of the officers were much better protected from access of flies. It would hardly seem necessary to demonstrate experimentally that flies and other insects passively carry bacteria; nevertheless numerous carefully controlled experiments have been made with this end in view, and successfully.

RULES FOR DEALING WITH THE FLY NUISANCE

KEEP THE FLIES AWAY FROM THE SICK, ESPECIALLY THOSE ILL WITH CONTAGIOUS DISEASES. KILL EVERY FLY THAT STRAYS INTO THE SICK ROOM. HIS BODY IS COVERED WITH DISEASE GERMS.

DO NOT ALLOW DECAYING MATERIAL OF ANY SORT TO ACCUMULATE ON OR NEAR YOUR PREMISES.

ALL REFUSE WHICH TENDS IN ANY WAY TO FERMENTATION, SUCH AS BEDDING STRAW, PAPER WASTE AND VEGETABLE MATTER SHOULD BE DISPOSED OF OR COVERED WITH LIME OR KEROSENE OIL.

SCREEN ALL FOOD.

KEEP ALL RECEPTACLES FOR GARBAGE CAREFULLY COVERED AND THE CANS CLEANED OR SPRINKLED WITH OIL OR LIME.

KEEP ALL STABLE MANURE IN VAULT OR PIT, SCREENED OR SPRINKLED WITH LIME, OIL OR OTHER CHEAP PREPARATION.

SEE THAT YOUR SEWAGE SYSTEM IS IN GOOD ORDER; THAT IT DOES NOT LEAK, IS UP TO DATE AND NOT EXPOSED TO FLIES.

POUR KEROSENE INTO THE DRAINS.

COVER FOOD AFTER A MEAL; BURN OR BURY ALL TABLE REFUSE.

SCREEN ALL FOOD EXPOSED FOR SALE.

SCREEN ALL WINDOWS AND DOORS, ESPECIALLY THE KITCHEN AND DINING ROOM.

BURN PYRETHRUM POWDER IN THE HOUSE TO KILL THE FLIES.

DON'T FORGET IF YOU SEE FLIES, THEIR BREEDING PLACE IS IN NEARBY FILTH. IT MAY BE BEHIND THE DOOR, UNDER THE TABLE OR IN THE CUSPIDOR.

IF THERE IS NO DIRT AND FILTH THERE WILL BE NO FLIES.

IF THERE IS A NUISANCE IN THE NEIGHBORHOOD WRITE AT ONCE TO THE HEALTH DEPARTMENT.

ISSUED BY

The Merchants' Association's Committee on Pollution of the Waters of New York

EDWARD HATCH, Jr., Chairman
J. PIERPONT MORGAN — JOHN Y. CULYER, C. E.
ALBERT VANDER VEER, M. D. — DANIEL D. JACKSON

JULY, 1908.

FLY RULES OF THE CHICAGO DEPARTMENT OF HEALTH

Screen all food and keep flies away from it.

Keep the streets clean.

Keep stable manure—breeding place for flies—in a vault or pit or screened inclosure and sprinkle its surface with chloride of lime.

Quickly cover up food after a meal and bury or burn table refuse.

Keep damp cloths near meat dishes, milk jugs, and other food receptacles.

Burn pyrethrum powder in the house. It will kill most of the flies and those it does not will fall stunned, when they may be swept up and burned. Sticky fly-papers are a second-rate palliative.

Remember that the exposure of any kind of refuse near a dwelling furnishes a breeding place for flies, and if food is exposed the flies will deposit germs upon it.

HEALTH DEPARTMENT BULLETIN

BEWARE OF FLIES

The common house-fly is a carrier of disease. Typhoid fever, diarrhœa, dysentery and tuberculosis are carried by flies.

No longer do we consider flies as merely annoying, but we recognize in them a very important factor in the spread of certain diseases, particularly those mentioned above.

Flies Are Filthy.—The house-fly is particularly filthy, because it has its birth-place and lays its eggs almost exclusively in horse manure.

Flies feed on food and also on the worst kind of filth. They go from one to the other. It is easy to understand how they carry disease germs to our food in this manner.

Our domestic animals, the dog and cat, though far from clean in all their habits, we like to have about us, but we keep them in their proper place. The house-fly, on the other hand, is tolerated everywhere, crawls over our hands and faces, gets into the milk, walks over all our food, often soiling and contaminating everything that comes in contact with its filthy feet and tongue.

Flies Also Feed on Sputum.—Who has not seen flies feeding on sputum on our pavements and streets? And, as there are people who have consumption, continually spitting on the public pavements, is it not simple to see how the germ of the disease can be taken up by the fly, carried away, and perhaps deposited in our homes?

It is particularly essential that flies be kept away from everything that infants and very young children come in contact with, particularly all feeding utensils and things that children are likely to put in their mouths.

How can we combat this dangerous nuisance?

The essential thing is to do away with the breeding places of these dirty pests.

It may be said that flies will breed in any decomposing animal or vegetable matter. The most common places are manure, uncleaned stables, privies,

and in and about cans and receptacles used for the storage of garbage.

Every householder, in SELF DEFENSE, should destroy the breeding places of these pests.

Store garbage in tightly covered cans, kept in a screened inclosure, so that flies cannot get to it; see that it is removed very frequently during the summer months. Wash and disinfect cans frequently.

Store manure so that flies cannot get at it to lay their eggs, and have it removed once a week.

All persons selling food of any description should see that the goods are protected from flies, and should not expose food in front of their stores where it can be contaminated by both flies and street dust.

Do not allow decaying matter of any kind to accumulate on your premises.

Screen the doors and windows of your house, particularly the kitchen, in order to keep the flies from entering and getting on the food.

Remember that the female fly lays about one hundred and twenty eggs, which in the course of a few hours become maggots, and after another transformation the full grown fly appears at the end of ten days.

As in most matters of sanitation and hygiene, CLEANLINESS is the watchword. CLEANLINESS about your house and property will prevent flies breeding.

BOARD OF HEALTH,
Orange, N, J.

BEWARE OF FLIES*

Flies are filthy insects. They drink from the cesspools and dine in the privy vaults. They eat the sputum on the sidewalk, and revel in the garbage pail. They swarm on the baby's diaper, and are greedy for the dressings from a discharging wound.

Perhaps you think it is disgusting to read about such things, and so it is. But is it not more disgusting to have these same flies, after their repast of filth, drown in the milk pitcher, drop their specks on the frosted cake, or clean their feet on the bread? Is it pleasant to see the flies that very likely have just come from a neighboring privy crawl over the lips of the sleeping baby, or gather on the nipple of its nursing bottle? Suppose the fly that was fished out of the milk pitcher had just been eating the excrement of a typhoid fever patient, would you like to drink the milk? Perhaps the flies that are walking on the fruit which you purchased at the street corner had just been feeding on the sputum of a consumptive. Does it not seem likely that flies may spread disease? That is what many physicians and health officers think.

Perhaps hereafter you will screen the house, and protect the food from flies.

The young of flies are maggots. They seem to prefer to breed in stable manure. But they also breed in excrement of all kinds, in garbage and in all sorts of wet and filthy refuse.

Do you want to raise these filthy insects, these germ-carriers, these indi-

*This circular, written by Dr. C. V. Chapin, Health Officer of Providence, R. I. is in use in that city and is recommended by the Massachusetts Association of Health Boards.

From FLIES *and* FILTH *to* FOOD *and* FEVER

The State Board *of* Health *of* Florida

ASKS *YOU* to carefully and attentively read this card; *THEN*, put the question directly to yourself, whether flies should not be destroyed, or, at least, an effort be made to keep from polluting food prepared for you to eat.

F*lies are disease carriers*
L*ive and breed in all kinds of filth*
I *nfect food and drink by germ-laden feet*
E*ach female fly can lay 150 eggs*
S*hould be kept out of dwellings*

Flies breed in horse manure, cow dung, decaying vegetables, garbage of all description, dead animals and human excrement.

Flies are Nature's scavengers, it is true, filling the same function as some bacteria do, but become an intolerable nuisance and DANGER when entering human dwellings and contaminating foods.

The presence of flies is a direct evidence of careless housekeeping and the existence of filth in some form about the premises.

Remember that when and where *absolute* cleanliness prevails there will be no flies.

Look daily after the garbage cans. See that they are carefully sprinkled with lime or kerosene oil and effectively covered.

Do the same thing to manure heaps, and remove all manure from stables every three or four days, and when removed, cover with lime and sand.

Look carefully after the Cuspidors. They require constant attention. This is particularly true in hotels, boarding houses, Station houses, Railroad Stations, and, in fact, wherever people congregate in large numbers.

Flies are fond of feasting on tuberculous sputum, and hover around cuspidors. The specks of flies contain live tubercle bacilli after they have eaten tuberculous sputum, showing that the bacilli will pass through the digestive tract of the fly in an active infective state.

Flies carry on their mouths (probosces) and on their legs, putrifying and disease germs, on which they have recently fed, and then crawl over food, infecting it, unless shut out by screens.

Keep flies from the SICK, especially those ill with communicable or contagious diseases. If the room is not screened the patient should be treated under a net, both for safety to others as well as for individual comfort.

SCREEN ALL FOOD. Apply this rule, not only to food prepared at home, but to food stuffs offered for sale, and especially fruits, salads and all other things which do not require to be cooked. For—

Flies crawl over fruits when exposed for sale, unguarded by screens, and the generality of people do not wash fruit before eating it. This is a fruitful source of human infection, particularly if a case of typhoid fever nearby is being carelessly handled.

Don't forget that flies will carry the bacilli of typhoid fever from the stools of the patient (if left exposed and not disinfected), if given an opportunity, to the food in the kitchen and dining room. This is no conjecture, for the Spanish-American War proved this fact.

The great secret of how to get rid of flies is CLEANLINESS, FIRST, and by screening all openings of the house, especially the kitchen and dining room.

Look at the marginal illustrations. They are disgusting, it is true. So are flies. The disgust that your stomach receives through your eye is as nothing, however, to the probable and possible benefit which you will receive by giving due heed to the warnings suggested by the etchings.

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cators of untidiness, to be a pest in our own house, and perhaps carry disease to your neighbors? Of course you do not.

Then keep the stable manure closely covered and have it removed often —once a week in summer, if possible. Keep the back yard and the alley clean. Allow no refuse to accumulate anywhere. Connect with the sewer if there is one in the street. Fix the privy so it will be fly-proof. After your own premises are in order talk over the matter with your neighbors, and get them also to read this circular.

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CORRESPONDENCE INVITED

Readers of this pamphlet, especially physicians and others having to do with the protection of the health of the public, are requested to communicate with the chairman of this committee any observations bearing upon the problems associated with the fly nuisance. Address the Chairman, Water Pollution Committee, Merchants' Association, 66 Lafayette street, New York.

NOTE.—Newspapers and periodicals desirous of reprinting the matter contained in this pamphlet are at liberty to do so, either with or without credit to the Merchants' Association.